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THE POOLING OF LEMONS

with special reference to
the Santa Paula Citrus Fruit Association

A Progress Report

by

H. R. Wellman and M. D. Street

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A Progress Report

H. R. Wellman[1] and M. D. Street[2]

PREFACE

This progress report is presented in compliance with a request by the Board of Directors of the Santa Paula Citrus Fruit Association for an analysis of the Association's pooling operations, to be used by the Board as a guide in determining what changes if any should be made in the pooling system.

The authors feel that their function is to determine what occurs under each of the major types of pooling systems and what advantages and disadvantages are inherent in each type, but not to decide which of the different types should be adopted by any particular association. In our opinion the responsibility of the Board of Directors is to decide between the different possible types of pooling plans and to choose the one which in its judgment is best.

The authors will particularly appreciate receiving pointed criticisms of the material contained herein and of the conclusions reached. It is our expectation to prepare a more comprehensive report on this subject during the coming months, and such criticisms should prove very helpful in connection therewith.

INTRODUCTION

The term "pooling" as used in this study means a particular method by which a cooperative marketing association may handle the products of its members. It involves (a) the physical mingling of the products, (b) the combining of sales returns, (c) the merging of operating expenses, and (d) the division of the net returns among the several members.

The chief purposes of pooling are (1) to spread the risks of marketing among the individual members, (2) to promote orderly marketing, and (3) to reduce the costs of operation. The extent to which these purposes can be realized under given conditions may be limited by the necessity of maintaining substantial equity between individual growers.

The term "equity" is essentially a subjective concept and may have different meanings to different persons. In this report "substantial equity" is deemed to be maintained when the division among its members of the total net returns received by an association is based upon the characteristics of lemons which the market signifies to be important as indicated by price differentials which tend to persist over a period of several years. Thus a pooling system is deemed to be equitable if the returns paid the individual growers over a period of several years closely reflect the average differences in the market value of their lemons.

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The establishment of a pooling plan requires the making of four key decisions, namely:

1. The number and content of concurrent grade pools.

2. The number and content of concurrent size pools.

3. The number of pooling periods during the season and the length of each pooling period (time pools).

4. The amount and location of territory to be included (area pools).

Since each of the above is capable of independent variation, numerous pooling systems, each differing in some degree from the others, are possible. This study will consider in detail only the major types now employed.

The essential question to which this study is directed is: What are likely to be the effects of variations in grade, size, and time pools upon (1) total returns to all members combined and (2) division of the total returns between the individual members. The securing of the largest total returns to all members combined involves the problems relating to orderly marketing and to costs of operation. The division of the total net returns between the individual members involves the problems relating to maintenance of substantial equity and to distribution of market risks.

The report is divided into three parts: (1) grade pools, (2) size pools, and (3) time pools.

GRADE POOLS

In the Santa Paula Citrus Fruit Association the bulk of the lemons is sorted into the following grades: Extra Choice, Choice, Standard, and culls. Lemons which do not meet the specifications of either Extra Choice, Choice, or Standard, but which are merchantable are classed as offgrade. Occasionally some lots of lemons are sold as orchard-run instead of being graded. Lemons smaller than 588's, usually termed "lemonettes," are removed at the washer by means of a mechanical sizer, but are not subsequently graded for quality, except that the culls are taken out.

In the Extra Choice and Choice grades, cured and tree-ripe lemons are kept separate. In the Standard grade, however, they are combined.

Pooling is on the basis of brands, which with their corresponding grades, are as follows:

Brand	Grade
Excellent	Extra Choice (cured)
El Merito	Extra Choice (tree-ripe)
Sunside	Choice (cured)
Superba	Choice (tree-ripe)
Wave	Standard (cured and tree-ripe)
Stock	Offgrade (cured and tree-ripe)

Lemons which are sold as orchard-run are pooled with Choice tree-ripe under Superba. Lemonettes, loose fruit, and culls are each pooled separately. [3]

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[3] The bulk of the loose-fruit sales consists of Standard tree-ripe lemons, although other grades are at times included.

The pooling unit is the pound, and the unit rates of payment are based upon the weighted-average prices received for each brand shipped during the period of the pool. Each grower receives the same price per pound for the same grade of lemons shipped in a given time pool.

At this stage of the analysis it will be assumed that (1) the pooling unit is comparable to the selling unit, (2) the unit rates of payments correctly reflect the market prices of the several grades, and (3) each grower is credited with the number of units of each grade which the fruit that he contributes to a given time pool actually contains.

Division of Total Net Returns between Growers:
Grade Pools vs. No-Grade Pools

At the outset it should be recognized that whether pooling on the basis of grades results in any different division of the total net returns between the individual growers than would obtain in the absence of grade pools depends, in all circumstances, upon the presence or absence of two sets of conditions: (1) variations between growers in the proportions of the several grades contributed by them during the period of time under consideration; and (2) differences between the average selling prices of the several grades for the specified period of time. Only if both sets of conditions are present will the division of the total net returns be different with grade pools from what it would be without grade pools. In the absence of either of the two sets of conditions, even though the other is present, the division would be the same in both cases.

Variations between Growers in the Proportions of the Several Grades Contributed.-- During the ten years 1925-26 to 1934-35, approximately 47 per cent of the Association's shipments of lemons consisted of Extra Choice cured fruit, which was marketed under the Excellent brand. This same percentage of Excellent fruit, however, was not produced by each grower. Table 1 shows the extent of the variation between 56 growers in the proportions of their total shipments which graded Excellent each year from 1925-26 to 1934-35. The two principal facts revealed by this table are first, that in each year there was substantial variation; and second, that the variation was larger in some years than in others.

Table 2 shows the extent of the average variation for the ten years 1925-26 to 1934-35, between 56 growers in the proportions of each of the major brands shipped. It will be noted that the variation was largest in the case of Excellent and smallest in the case of Wave. With each of the brands, however, the variation was significant. It will also be noted that the average variation in the proportion of Excellent for the ten-year period is less than the variation in any one of the ten years (see table 1).

The 1925-26 to 1934-35 average percentage of their total packed-fruit shipments under Excellent brand of each of the 56 growers is shown in table 3. Over this period the shipments of some growers contained a much larger percentage of Excellent lemons than did the shipments of other growers.

The consistency with which the shipments of the 56 growers contained a larger or smaller percentage of Excellent lemons than the average of the Association during the ten years is shown in table 4. The fruit of some growers consistently ran heavily to first grade, while that of other growers consistently ran light to first grade.

Differences between the Average Selling Prices of the Several Grades.-- Table 5 shows the amount per packed box that the weighted-average f.o.b. prices of El Merito, Sunside, Superba, and Wave have been below or above the weighted-

TABLE 1

Lemons: Santa Paula Citrus Fruit Association; Variations as between Growers in the Proportions of Excellent Brand Contributed, by Years, 1925-26 to 1934-35

Year November-October	Mean	Standard deviation
	per cent	per cent
1925-26	32.8	6.3
1926-27	30.7	5.9
1927-28	61.2	7.7
1928-29	51.3	7.7
1929-30	68.7	6.9
1930-31	48.7	10.6
1931-32	35.5	9.5
1932-33	45.7	7.9
1933-34	55.6	8.7
1934-35	23.6	10.3

TABLE 2

Lemons: Santa Paula Citrus Fruit Association; Variations as between Growers in the Proportions of the Several Brands Contributed, Average 1925-26 to 1934-35

Brand	Mean	Standard deviation
	per cent	per cent
Excellent	45.4	5.6
El Merito	15.7	4.2
Sunside	17.5	3.8
Superba	17.3	3.8
Wave	3.6	1.3

TABLE 3

Lemons: Santa Paula Citrus Fruit Association; Frequency Distribution of Percentage of Total Packed-Fruit Shipments under Excellent Brand of 56 Growers, Average 1925-26 to 1934-35

Class interval in per cent of shipments	Number of growers	Per cent of growers
29.9 to 32.3	1	1.8
32.4 to 37.3	2	3.6
37.4 to 42.3	11	19.6
42.4 to 47.3	24	42.9
47.4 to 52.3	10	17.8
52.4 to 56.8	8	14.3
Total	56	100.0

TABLE 4

Lemons: Santa Paula Citrus Fruit Association; Comparison of Percentage of Total Packed-Fruit Shipments under Excellent Brand of 56 Growers with the Average of the Association, 1925-26 to 1934-35

Number of years below association average	Number of growers	Per cent of growers
10	6	10.7
9	3	5.4
8	10	17.8
7	9	16.1
6	4	7.1
5	7	12.5
4	3	5.4
3	4	7.1
2	3	5.4
1	5	8.9
0	2	3.6
Total	56	100.0

[illegible]

[illegible] of percentage of Total Fresh-fruit [illegible] brands of 36 growers, average [illegible] on 1933-34.

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

[illegible]

[illegible] Citrus fruit associations: Comparison of [illegible] fresh-fruit [illegible] under [illegible] with the average of the Association, [illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

average f.o.b. price of Excellent each year from 1925-26 to 1934-35.[4/] The chief tendencies exhibited in this table are (1) for the price differential between the several brands to be substantial in each year, (2) for Excellent to bring more than El Merito, El Merito more than Sunside, Sunside more than Superba, and Superba more than Wave, and (3) for the price differentials between the several brands to narrow.

Differences in Returns to Individual Growers with Separate Pools for Each Grade as Compared with No-Grade Pools.-- In this section of the report the following conditions are assumed to be true: (1) that the total net returns of the Association would have been the same without grade pools as they were with grade pools; and (2) that the proportions of the several grades contributed by each grower would have been the same without grade pools as they were with grade pools.

Table 6 is designed to show the differences in the average returns per packed box to individual growers for the ten-year period from 1925-26 to 1934-35 with separate pools for each grade as compared with no-grade pools. With all grades combined, about 68 per cent of the growers would have received over this ten-year period within 5 cents a packed box of the average price which they actually received. Over 20 per cent of the growers, however, would have received from 6 to 10 cents a box more or less than the average prices which they received, while nearly 10 per cent of the growers would have received from 11 to 15 cents a box more or less.

Judging from the variations between growers in the proportions of the first grade contributed (table 1) and from the differentials between the average f.o.b. prices of the several grades (table 5), it may be concluded that much the same situation as is shown in table 6 characterizes each of the ten years from 1925-26 to 1934-35. In each of the years the variations between growers in the proportions of the several grades contributed was greater than the average of the ten years. In some years, however, the price differentials between the several grades were considerably smaller than the average of the ten years, while in other years they were considerably larger. In those years in which the price differentials between the several grades were larger than the average of the ten-year period, the differences in returns to growers with separate grade pools as compared with no-grade pools would have been larger than those shown in table 6.

Determination of the Number of Units of Each Grade Contributed by Individual Growers

If each grower is to be credited with the number of units of each of the grades which the fruit that he contributed to a given time pool actually contained, the following requirements must be met:[5/]

1. The sorting must be done in such a way that all the lemons in each of the grades are reasonably uniform in quality and that the average quality of the lemons in one grade is significantly different from the average quality in another.

2. The sorting must be reasonably uniform as between the fruit of the several growers.

3. The fruit of each grower must be sorted separately.

[4/] The question whether or not the weighted-average-price differentials correctly reflect the differences in the market value of the several grades is discussed under the section headed "Determination of Price Differentials between Grades."

[5/] The problem relating to differences in grade arising from variations in the length of time the individual lots are kept in storage is discussed later.

[illegible] the index of [illegible] from 1926-30 to 1931-35. The other [illegible] this condition [illegible] (1) [illegible] and (3) [illegible] several [illegible]

[illegible] (1) that [illegible] (2) that [illegible] would [illegible]

Table 6 is designed to show the difference in the average returns per [illegible] to individual growers for the [illegible] period from 1926-30 to 1931-35 [illegible] for each grade as compared with [illegible] per cent of the growers [illegible] over 20 per cent [illegible] growers would have received from 11 to 15 cents [illegible]

Aside from the variations among growers in the percentage of the [illegible] of the several grades (table 5), it may be concluded that [illegible] is shown in table 6 [illegible] In each of the years the [illegible] of the several grades contributed [illegible] Consequently, however, the price [illegible] smaller than the average [illegible] larger. In these years [illegible] several grades [illegible] larger than the average [illegible] grades would have [illegible] shown in figure 2.

Determination of the Index of [illegible]

[illegible]

1. [illegible]

2. [illegible]

3. [illegible]

1/ The question of [illegible]

2/ The [illegible]

TABLE 5

Lemons: Santa Paula Citrus Fruit Association; Weighted-Average F.O.B. Prices per Packed Box of Excellent Lemons, and Differentials between the Prices of Excellent and Other Brands, 1925-26 to 1934-35

Year November-October	F.o.b. price Excellent	Price differentials between Excellent and			
		El Merito	Sunside	Superba	Wave
	dollars per box	dollars per box	dollars per box	dollars per box	dollars per box
1925-26	4.08	-0.82	-0.94	-1.32	-1.31
1926-27	5.40	-0.96	-1.05	-1.97	-1.15
1927-28	5.55	-0.78	-0.77	-1.53	-1.82
1928-29	5.72	-0.79	-0.83	-1.26	-1.63
1929-30	5.85	-0.77	-1.07	-0.94	-1.84
1930-31	4.81	-0.10	-0.92	-0.57	-1.57
1931-32	4.38	-0.84	-0.36	-0.97	+0.24
1932-33	4.00	-0.55	-0.85	-1.05	-1.81
1933-34	4.29	-0.34	-0.86	-0.67	-1.53
1934-35	3.66	-0.56	-0.74	-0.25	-0.73
Averages:					
1925-26 to 1929-30	5.32	-0.82	-0.93	-1.40	-1.55
1930-31 to 1934-35	4.23	-0.48	-0.75	-0.70	-1.18
1925-26 to 1934-35	4.77	-0.65	-0.84	-1.05	-1.36

TABLE 6

Lemons: Santa Paula Citrus Fruit Association; Frequency Distribution of Differences in Returns per Packed Box to 56 Growers with Separate Pools for Each Grade as Compared with No-Grade Pools, Average 1925-26 to 1934-35

Class interval in cents per box	Number of growers	Per cent of growers
0 to 5	38	67.9
6 to 10	12	21.4
11 to 15	5	8.9
16 to 20	1	1.8
21 and over	0	0.0
Total	56	100.0

4. The number of units of each grade must be determined before one grower's fruit has become commingled with that of other growers.

It appears that each of these four requirements has been met satisfactorily by the Santa Paula Citrus Fruit Association and other associations which pack from trays, and that the first two requirements have been satisfactorily fulfilled by associations packing from belts, bins, or tubs.

In all associations the fruit is sorted into the several grades by inspection rather than by mechanical means. The bulk of the lemons in any one lot would be sorted in the same way by different graders or by the same grader at different times. The difficulty in securing uniformity of grading is in connection with those lemons which fall at the extremes of the grade limits. With such lemons there may be differences of opinion, even among the most expert graders, whether they should be placed in the higher or in the lower grade, and the same expert may decide one way at one time and the other way at another time. Nevertheless, when done by experienced people under careful supervision, the grading within an association is sufficiently uniform so that buyers seldom discriminate between lemons of the same grade packed from different lots of fruit. As a general rule, if grading is sufficiently uniform for the purposes of selling, it is also sufficiently uniform for the purposes of pooling.

In the Santa Paula Citrus Fruit Association, the individual lots of fruit, however small, are kept entirely separate until after they have been graded and the number of pounds of each grade in each lot determined. Thus, each grower is credited not only with the total number of pounds of lemons (less shrinkage) delivered to the packing-house from his orchard, but also with the number of pounds of each grade which his fruit contained at the time it was graded. This same situation applies generally to all associations grading into and packing from trays, since the identity of the individual lots is maintained until after the weight of the fruit in the trays has been determined.

Within the past ten years many of the lemon packing-houses in the state have discarded grading tables and packing trays and installed grading belts with either packing belts, tubs, or bins. Packing belts are the most numerous. The two reasons generally given for this change relate to costs of operation and size pools. 6/

Packing-house managers who have operated with both the tray and the belt systems are unanimous in the opinion that costs of grading and packing are at least 5 cents a packed box less with belts than with trays, and some managers claim a saving in costs of as much as 15 cents a packed box. Although comparable records relative to the costs of the two systems are not available, careful observation supports the claim of a reduction in costs, provided fairly continuous operation is secured. 7/ The difficulty is that the continuity of operation which is essential in order to secure low costs prevents the keeping of small lots of fruit entirely separate until after the number of units of each grade has been determined.

The pooling unit employed by associations packing from belts, tubs, or bins is the packed box. The number of packed boxes of each grade of fruit obtained from a given lot cannot be precisely determined until after the lot has been packed. But to keep small lots of fruit entirely separate until after they have

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6/ The use of packing belts, tubs, and bins in connection with pooling on the basis of size is discussed under "Size Pools."

7/ The largest part of the reduction appears to be in the cost of grading rather than in the cost of packing, although some saving in the cost of packing is apparently secured.

(1) [illegible] grades [illegible]

[illegible] by the United Fruit, Citrus Fruit [illegible] than any other [illegible], and that the first two requirements have been [illegible] by [illegible]

In all associations the fruit is sorted into the several grades by inspection rather than by mechanical means. [illegible] The difficulty in [illegible] uniformity of grades [illegible] of the grade [illegible] there may be differences of opinion, even among the most expert graders, whether they should be placed in the higher or in the lower grade, and the [illegible] one way at one time and the other way at another time. [illegible] done by experienced people under careful supervision, [illegible] is sufficiently uniform [illegible] general rule, [illegible] grading is sufficiently uniform for the purposes of selling, [illegible] uniform for the purposes of pooling.

In the larger [illegible] Citrus Fruit Associations, the individual [illegible] however small, [illegible] the number of [illegible] of each grade [illegible] from the orchard [illegible] of the grade [illegible]

[illegible] grading [illegible] (Table 2)

[illegible] the cost [illegible] in costs of [illegible] a packed box [illegible] relative to the [illegible] of the two grades [illegible] 3/ The [illegible] is that [illegible] in order to [illegible] low costs [illegible] a packed unit after the number of units of each grade [illegible]

The [illegible] unit [illegible] packed box. The number of [illegible] from a [illegible] but cannot be [illegible] by [illegible]

2/ The use of grading [illegible]

3/ The [illegible] of their boxes to the point of packing, [illegible] been packed would result in much idle time on the part of both the workers and the equipment. The cost which this would entail apparently is so great that no association with numerous members actually does it. Instead they have resorted to two devices: (1) estimating cleanups, and (2) combining lots containing only a few boxes each.

Estimating Cleanups.-- After each lot of fruit has passed over the grading belt and has been sorted into the several grades, the amount of fruit of each grade remaining on the packing belts (or in the tubs or bins) and in the partially packed boxes is determined by experienced estimators on the basis of inspection. The estimated amounts are then added to the number of boxes of each grade packed from that lot and subtracted from the number of boxes of each grade packed from the next succeeding lot. The two problems involved here are (1) the determination of the total quantity of all grades combined and (2) the determination of the total quantity of each of the grades. The first of these two problems is less difficult than the second.

At the start of grading, the total number of storage boxes in each lot is known, and if desired the net weight of the fruit in each lot can be ascertained. The amount of culls obtained from the lots and the amounts of the grades set back for packing later can be determined either in terms of storage boxes or pounds. By subtracting the culls and "setbacks" from the original quantity, the quantity of fruit actually packed from the lot can be closely approximated, either in terms of pounds, storage boxes, or equivalent packed boxes, whichever is desired. [8] With the use of some such system as outlined above, the total quantity of packed fruit credited to each grower would not be significantly different from the quantity that would be obtained if each lot were kept entirely separate.

The greatest difficulty in connection with estimating cleanups is in determining the quantity of each grade and size. [9] The number of storage boxes in or the net weight of the lot is of use only in checking the total number of boxes of all grades packed, but not in checking the number of boxes of each grade packed. In the absence of some device for recording the quantity of each grade between grading and packing, the number of units of each grade credited growers is subject to the errors of estimate.

The volume of fruit remaining on the belts (or in the tubs or bins) and in the partially packed boxes at the end of the grading of each lot tends to vary within rather wide limits, as is shown in table 7. In the case of lots containing a relatively few boxes, the entire determination of the number of units of each of the grades being packed at a given time is based upon estimates, while in the case of lots containing a large number of boxes the major part of the determination is based upon actual pack-out with only a minor part based upon estimate. This is illustrated in table 8.

Although as far as could be ascertained no adequate tests have been made regarding the accuracy of the estimates of cleanups, the consensus of opinion among packing-house managers is that the estimates for any given grade are not likely to be more than 2 or 3 packed boxes different from the actual amounts. In one association each cleanup is estimated separately by two experienced estimators. The differences in their estimates of 30 lots selected at random are shown in

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[8] Some associations consistently check the estimates of cleanups in this fashion; other associations make only occasional checks.

[9] The problem of estimating the number of units of each size is discussed under "Size Pools."

TABLE 7

Lemons: Association C; Number of Packed Boxes Estimated on Cleanups of Ten Individual Lots, 1936

Lot number	Extra Choice			Choice		
	On belt	Partially packed	Total	On belt	Partially packed	Total
	boxes	boxes	boxes	boxes	boxes	boxes
1	9	16	25	5	6	11
2	11	5	16	5	3	8
3	9	10	19	8	6	14
4	8	8	16	11	0	11
5	10	6	16	7	5	12
6	12	28	40	3	2	5
7	11	8	19	5	6	11
8	14	8	22	4	6	10
9	14	12	26	11	9	20
10	14	12	26	5	9	14

TABLE 8

Lemons: Association D; Number of Boxes Packed Out, Extimated on Cleanups, and Total Credited Growers; Four Individual Lots, 1936

Lot number	Extra Choice			Choice		
	Packed out	Estimated	Total	Packed out	Estimated	Total
	boxes	boxes	boxes	boxes	boxes	boxes
1	0	23	23	0	12	12
2	53	24	77	14	23	37
3	84	29	113	22	9	31
4	282	30	312	61	12	73

table 9. It cannot, of course, be assumed that the differences between the actual and nearest estimate were the same as the differences between the two estimated amounts.

In most associations only Extra Choice and Choice are packed at the same time, while Standards are set back for packing later. Now even when the sum of the estimates of both of those grades of a particular lot is correct, the Extra Choice may be overestimated and the Choice underestimated, or vice versa. It should also be recognized that each lot except the first and last between complete cleanups is subject to two estimates, and that any errors in the two estimates on a given lot are as likely to be in the same as in the opposite direction. Suppose, for example, on the first lot after a complete cleanup the estimates show 2 boxes more Extra Choice and 2 boxes less Choice than the fruit actually contains. Since these estimates are added to lot No. 1 and subtracted from lot No. 2, the second lot would show 2 boxes less Extra Choice and 2 boxes more Choice than it contains, providing that the estimates of the cleanup on lot No. 2 were correct. It may happen, however, that the estimates of the cleanup of the second lot show 2 boxes more Choice and 2 boxes less Extra Choice than the fruit on the belt and in the partially packed boxes contains. Under this situation lot No. 2 would be credited with 4 more boxes of Choice and 4 fewer boxes of Extra Choice than it would if the fruit had been packed entirely separate.

Over a period of time errors in estimates of this sort tend to be compensating rather than cumulative, so that the net error involved in an entire season's operation tends to be less than the error in connection with a single lot; and likewise, the net error over a period of several years tends to be less than the net error in a given year. With fairly large individual lots, the net error on a year's deliveries cannot be very significant, while over a period of years it will be negligible. As the individual lots become smaller, however, the error in estimating constitutes a larger proportion of the delivery. With fairly small lots such errors may be significant in amount. It appears probable that during a year some growers may be credited with 2 or 3 per cent more boxes of a given grade than their lemons actually graded, while other growers may be credited with 2 or 3 per cent fewer boxes. [10]

Combining Lots Containing Only a Few Boxes Each.-- In order to secure economical operation, associations packing from belts, tubs, or bins combine several lots containing only a few boxes each and run them as one lot. In most cases the total number of packed boxes of each grade obtained from the combination lot is prorated among the several growers on the basis of the number of storage boxes contributed by each. Thus each grower is credited with the average grade-out of the combination lot irrespective of whether his particular fruit was above or below the average.

By recognizing that there is substantial variation in the proportions of the several grades in small as well as in large lots, some associations follow the practice of combining lots which appear to be similar in quality and of placing fruit which is known to be markedly different in separate combination lots. At least one association has gone a step further. With lots containing from 11 to 50 storage boxes which are combined, it separately grades each lot, determines the quantity of culls and Standards, and estimates the percentage of Extra Choice in

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[10] About as large an error as this might arise in the process of grading. With two lots identical in quality, 2 or 3 per cent more of one lot than of the other might be placed in the first grade.

TABLE 9

Lemons: Association D; Frequency Distribution of Differences in Number of Packed Boxes Estimated on Cleanups by Two Estimators, Thirty Individual Lots, 1936

Class interval in number of boxes	Number of lots
0	13
1	10
2	3
3	2
4	2
Total	30

TABLE 10

Lemons: Santa Paula Citrus Fruit Association; Frequency Distribution of Percentages of Total Annual Deliveries of 101 Growers in Lots of 50 Storage Boxes and Less, 1933-34 and 1934-35

Class interval in per cent	Number of growers	
	1933-34	1934-35
0.0 to 9.9	45	69
10.0 to 29.9	30	20
30.0 to 49.9	11	8
50.0 to 74.9	8	2
75.0 to 100.0	7	2
Total	101	101

the remainder. These percentages are then used in prorating the pack-out from the combination lot among the several growers. Methods such as these are an improvement over straight combination lots containing fruit markedly different in quality, but they do not appear to provide sufficient accuracy to justify the claim that fruit in combination lots is pooled on the basis of grade.

To the extent that combination lots are employed, the pool statements of individual growers, which do not show the amount of the grower's fruit in such lots, give an impression of much greater accuracy than actually exists. The usual pool statement shows the total shipments of a grower's fruit broken down by grades, but with no indication of the amount of such fruit in combination lots. Unless they are fully acquainted with the operations of their association, growers having a relatively small quantity of lemons naturally believe that their pool statements show the precise grades obtained from their fruit, when as a matter of fact they may not. From the standpoint of revealing the actual situation, pool statements of individual growers might well show the number of storage boxes placed in combination lots. At least one association handling grapefruit does this.

A number of suggestions have been made for overcoming the disadvantages of no-grade pools for fruit in combination lots when packing from belts, tubs, or bins, while at the same time retaining the low costs arising from continuous operation. Thus far, however, none of these suggestions has been tried and until some experience with them has been had, their possibilities cannot be accurately appraised. The three which appear to justify experimentation are (1) mechanical sizers and counters, (2) sample grading, and (3) automatic weighing devices. [11]

When the grades are determined by sorting the entire lot, the chief problem peculiar to combination lots is that of determining the number of units of each grade between grading and packing. Individual lots containing as few as 5 storage boxes can be graded separately without undue cost, but cannot be packed separately. Under the present methods of operation, however, the number of units of each grade cannot be determined until after the fruit is packed. If it should prove commercially feasible to record, by means of automatic weighing devices installed between the grading and packing equipment, the number of pounds of each grade of fruit prior to packing, growers with fruit in combination lots could be paid in accordance with the particular grades of their fruit. The pooling unit for combination lots would then be the pound rather than the storage box.

In the Santa Paula Citrus Fruit Association the individual lots run considerably larger than the average of all the associations in the state, but even in this Association there are many small lots. In considering this problem, it should be kept in mind that an individual lot consists not of the entire crop of the grower, but of only the part of the fruit from one picking, and there are usually from 7 to 10 pickings. After taking out the washer culls and lemonettes, each picking of each grower is divided into at least as many individual lots as there are separate color classifications, of which there are generally four or five. [12] In addition, a given color of fruit of a grower may be placed in two or more different blocks in the storage room. An individual grower's lot consists of only the lemons of a given color from one picking which are stored in the same block.

Table 10 is designed to show the proportions of the annual deliveries of

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[11] The problems connected with mechanical sizers and counters are discussed under "Size Pools;" those relating to sample grading are discussed later in this part of the report.

[12] The division into the several color classifications is not, of course, equal.

the growers in the Santa Paula Citrus Fruit Association that were in individual lots of 50 storage boxes and less in 1933-34 and 1934-35. It will be noted from table 10 that in 1933-34, a year of about average yields per acre, 26 of the growers had 30 per cent or more of their fruit in lots of 50 storage boxes and less, while 7 of the 101 growers had 75 per cent or more of their fruit in such lots. In 1934-35, however, when yields per acre were much above average, considerably fewer growers had a relatively large proportion of their annual deliveries in lots of 50 storage boxes and less. On the other hand, in years of low yields per acre, it would be expected that the number of growers having a relatively large proportion of their crops in such lots would be increased.

Differences in Grade Occasioned by Length of Time in Storage.-- Thus far it has been assumed that the grades obtained from different lots correctly reflect the inherent differences in the quality of the fruit. This assumption is valid only if the lots are graded after being in storage for comparable lengths of time under uniform storage conditions. The quality of the fruit is affected by the length of time it is held in storage and by the conditions under which it is held as well as by its inherent characteristics.

In all associations the lemons are held in storage for the accounts of the individual growers. Grading is done after the fruit is taken from storage and just prior to the time it is shipped. During a considerable part of the year there is a larger volume of lemons available for shipment than can be marketed. Since all of the fruit, particularly that received during the winter months, cannot be marketed as soon as it is ready for shipment, the manager must select the particular fruit to be shipped at any given time and the remainder must stay in storage. This situation occasions little difficulty with respect to the determination of the grades of each grower's fruit at the time of shipment in years when the supply and demand conditions are such that all of the fruit can be shipped before it has begun to deteriorate in quality. But in years like 1934-35 when considerable quantities of lemons had to be held in storage long past their prime, the problem may be acute. Some growers may secure relatively large gains while other growers may experience substantial losses merely by reason of their position in the picking schedule or by reason of the choice of the manager in shipping fruit of one color classification rather than of another. 13/

An example of an extreme situation with respect to variations in the length of time lemons of the same color classification were held in storage is shown in table 11. Probably the lots of light-green lemons which were held in storage between four and five months suffered considerably more from deterioration in grade and shrinkage than those held in storage three months or less. Likewise, the lots of silver lemons which were held in storage between three and four months probably experienced more deterioration in grade and shrinkage than those held in storage two months or less.

Adequate handling of this problem necessitates the employment of some method for determining the grades of the individual lots which are held in storage beyond their prime prior to the time the fruit begins to deteriorate in grade. It does not appear at all impossible for an association to establish the normal lengths of

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13/ Within each color classification the order of shipments is usually based upon the time of arrival at the packing-house, while between color classifications the order of shipments is usually based upon the condition of the fruit with respect to the length of time it can be held in storage without becoming unmerchantable.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

TABLE 11

Lemons: Santa Paula Citrus Fruit Association; Frequency Distribution of Number of Days that Individual Lots of Light-Green and Silver Lemons Delivered in December, 1934, Were Held in Storage

Class interval in days	Light green		Silver	
	Number of lots	Per cent of lots	Number of lots	Per cent of lots
60 and less	15	23.4	31	44.3
61 to 90	0	0.0	19	27.1
91 to 120	24	37.5	20	28.6
121 to 150	25	39.1	0	0.0
Total	64	100.0	70	100.0

TABLE 12

Lemons: Santa Paula Citrus Fruit Association; Comparison of Price Differentials between Selected Brands Based upon Weighted-Average Prices and upon Simple Average of Prices in Corresponding Months, 1925-26 to 1934-35

Year November-October	Difference between Excellent and Sunside		Difference between Excellent and Wave	
	Weighted average	Simple average	Weighted average	Simple average
	dollars per box	dollars per box	dollars per box	dollars per box
1925-26	-0.94	-0.75	-1.31	-1.27
1926-27	-1.05	-1.10	-1.15	-2.13
1927-28	-0.77	-0.60	-1.82	-1.47
1928-29	-0.83	-0.99	-1.63	-2.28
1929-30	-1.07	-1.00	-1.84	-2.17
1930-31	-0.92	-1.00	-1.57	-2.51
1931-32	-0.36	-0.70	+0.24	-1.98
1932-33	-0.85	-0.86	-1.81	-1.87
1933-34	-0.86	-0.88	-1.53	-1.73
1934-35	-0.74	-0.85	-0.73	-1.81
Averages:				
1925-26 to 1929-30	-0.93	-0.89	-1.55	-1.86
1930-31 to 1934-35	-0.75	-0.86	-1.18	-1.98
1925-26 to 1934-35	-0.84	-0.87	-1.36	-1.92

time the fruit in each color classification can be held in storage without appreciable loss from deterioration in quality and shrinkage. Such normal storage periods may be different at one part of the season from those at another. If each lot which has been held in storage for the established normal length of time could be graded immediately, the individual growers could then be paid in accordance with the inherent qualities of their fruit. In the opinion of packing-house managers, such a procedure would be very expensive. Much the same results, however, might be secured without excessive costs by determining the grades on the basis of representative samples taken at the washer.

Although the grades of many agricultural products are determined on the basis of samples, this system has never been used in the case of lemons. Whether or not it would prove satisfactory for lemons cannot be determined in advance of careful experimentation. The two chief objections against it relate to the securing of a representative sample and the proper curing of the sample. If these two problems could be solved, then a sample from each grower's deliveries would be taken just after the fruit was washed. It would then be sorted by color and placed in storage. At the end of the normal storage period for each color classification, the fruit of that color in the sample would be graded and the grades thus obtained would be applied to the entire lot for the purpose of determining the grower's grade credits. [14] This method, if it should prove to be satisfactory, would, in addition to eliminating the differences in grades between individual lots arising from variations in the length of time the fruit is held in storage, go far toward solving the problems relating to cleanups and combination lots.

Determination of Price Differentials between Grades

When pooling is on the basis of grade the question arises as to how to determine the price rates to be applied to each grade in setting up the money credits to growers. The simplest method and the one which is universally used by lemon packing-houses is merely to divide the total net amount of money received for each grade during the period of the pool by the number of units of that grade sold. Another method, which has some advantages, although involving more clerical work, is to base the rates upon a simple average of the price differentials between the several grades prevailing on the same markets on the same days. If the proportions of the several grades were the same in each car shipped during the time pool, the two methods would give identical results. But this situation seldom prevails. The general situation is that some cars contain a larger proportion of some grades than do other cars. The result is that the weighted-average prices of each grade may vary because of either (1) differences in prices between grades on the same market on the same day, (2) differences in the level of prices of all grades on the same market on different days, or (3) differences in the level of prices of all grades on different markets on the same day. In most cases the differences between the weighted-average prices of the several grades for a given pooling period are the result of a combination of the three.

There is considerable basis for contending that the price rates used in determining the money credit to growers should reflect only the price differentials between the several grades on the same markets on the same days, and not the differences in the level of prices of all grades, which occur by reason of the market to which they were shipped or by reason of the time at which they were shipped.

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[14] Each grower's size credits could also be obtained from the sample.

In order to obtain the largest total returns for all growers combined, the manager, rather than the individual growers, should determine the time and place of shipments. Yet his decisions, although resulting in the largest possible total returns to the association, under the existing conditions, may result in certain grades bringing either more or less than they would have brought if his decisions had been different.

Table 12 shows a comparison of the price differentials between Excellent and Sunside and between Excellent and Wave computed from the weighted-average prices and from the simple averages of prices in corresponding months. There are substantial differences in the results obtained by the two methods of computation, in both amount and direction. The use of the weighted-average prices indicates a material decrease in the average price differentials during the five years 1930-31 to 1934-35 as compared with the previous five years, yet the use of the simple average of prices in corresponding months shows no significant narrowing. In general the differentials based upon weighted-average prices are less than those based upon simple-average prices. This is most pronounced in the case of Wave.

In 1931-32 the weighted-average price of Wave was $0.24 a packed box above the weighted-average price of Excellent, yet at no time during that year did Wave sell for as much as Excellent. During the months in which both brands were sold the price of Wave averaged $1.98 a packed box below the price of Excellent. In this case the weighted-average prices of the two brands reflected not the differences in the quality, but the differences in the time they were shipped. The simple average of the prices during the months both brands were sold provided a much closer approximation to the price differentials occasioned by differences in quality alone. While this example represents an extreme case, a careful examination of table 12 shows that somewhat the same type of situation has occurred rather frequently during the past ten years.

On the same market on the same day comparable sizes of Extra Choice lemons have consistently brought more than Choice lemons, while Choice lemons have consistently brought more than Standard lemons. During 1933-34, for example, on corresponding days the averages of prices at New York for these three grades of cured fruit, size 360's, show that Extra Choice brought $0.80 a packed box more than Choice and $1.46 a box more than Standard. In the case of tree-ripe fruit, Extra Choice brought $0.85 a packed box more than Choice.

The situation with respect to the determination of the price differentials between comparable grades of cured and tree-ripe lemons is in a somewhat different category from that relating to the determination of the price differentials between the different grades of cured lemons and between the different grades of tree-ripe lemons. From the standpoint of prices, the chief difference between cured and tree-ripe lemons at the present time relates to the time of the year they can be shipped, with a minor difference in regard to sizes.

The price differentials between cured and tree-ripe fruit of the same grades and sizes sold on the same markets on the same days have tended to narrow materially in recent years. At one time eastern buyers purchasing lemons in the spring months demanded fruit which could be held in storage for a considerable length of time, since they intended it not for immediate consumption but for holding until hot weather developed. With the regulation of shipments under the California Fruit Growers Exchange Lemon Agreement, the opportunities for gain on speculative purchases have been reduced, with the result that almost all the lemons now purchased by wholesalers are destined for prompt movement into consumption. Since consumers are concerned only with the quality of the lemons at the time of

In order to obtain an appropriate [illegible] rather than the individual [illegible]

[illegible]

[illegible]

[illegible] in quality alone. Since this example represents an unusual case, a careful [illegible]

[illegible] During 1952-53, for example, [illegible]

[illegible]

[illegible]

[illegible] could not necessarily have been [illegible]

[illegible] only when the quality of [illegible] time of purchase and not with the length of time they can be held before deteriorating, they do not discriminate between cured and tree-ripe lemons of the same quality and size. This condition is reflected back to the wholesale market, with the result that comparable grades and sizes of cured and tree-ripe lemons on the same markets at the same time tend to sell at about the same prices. At New York in 1933-34 Extra Choice cured lemons, size 360's, brought only $0.12 a packed box more than the same size of Extra Choice tree-ripe lemons, while Choice cured lemons brought only $0.09 a packed box more than Choice tree-ripes.

By-Products Pool

The pooling of by-products lemons is a special case of grade pools. The problems involved center around the question of who is to take the loss on fruit sent to the products plant. Is the loss to be borne entirely by the individual growers of such fruit or is it to be shared by all growers?

In the Santa Paula Citrus Fruit Association, as well as in most other associations, all fruit sent to the by-products plant is for the account of the individual growers. In some associations the gross returns received from the products plant are distributed among the several growers, but in other associations a handling charge is first deducted. In any event, the returns which the growers receive for by-products fruit are very small.

The difficulty arises out of the fact that in years of excessive supply a considerable proportion of the fruit sent to the products plant was at one time merchantable, and on which a shipping allotment was secured under the Exchange Lemon Agreement. There appears to be little doubt but that strictly cull fruit should receive only the by-products returns, and there is considerable merit in assessing such fruit with the direct costs of handling it. But what about fruit which would have graded Choice if the grading had been done within a reasonable length of time after the lot was received? It is difficult to refute the contentions that merchantable fruit, by being withheld from the market, contributed to the price received for the fruit that was shipped, and that it contributed to the prorate under which other fruit was shipped. These two contentions are quite distinct and will, therefore, be treated separately.

Contributions to the Price Received for Fruit Shipped.-- An analysis of the relation between the total shipments of lemons and the average f.o.b. prices clearly shows that at any given time a reduction in shipments is accompanied by an increase in prices, while an increase in shipments is accompanied by a decrease in prices. The sending of merchantable lemons to by-products results in a decrease in shipments below what they otherwise would have been and in an increase in the price received for the lemons shipped.

If it is desired to pay growers of merchantable by-products fruit a higher price per unit than the association receives for such fruit, the first question to be determined is whether the additional compensation is to be a flat rate irrespective of the quality of the fruit or is to vary with the grade. In 1934-35 one association paid its growers a flat rate of $5.00 a ton on all by-products fruit. This procedure made it unnecessary to determine the grades sent to the products plant. The cost of the payment was treated as an operating expense against all fruit shipped.

Varying the compensation on by-products fruit with the grade gives rise to three questions: (1) How are the number of units of each grade in the individual lots to be determined? (2) What rates are to be paid for each grade? (3) From what source is the money to be obtained?

Thus far, associations sending merchantable fruit to the products plant have employed either of two methods for determining the grades: (1) actually grading the lots and (2) estimating the proportions of the several grades in the lots, commonly termed "pencil packing." The individual lots are graded only if it is intended to ship the Extra Choice fruit. The difficulty with this method is that the grades obtained may reflect not so much the inherent characteristic of the fruit in the lot as the length of time it has been in storage. This problem has already been discussed. The method known as "pencil packing" represents simply the best guess of the manager or packing-house foreman with respect to the grades contained in a given lot. These men are, of course, familiar with the general type of fruit produced by each grower, and consequently, on the average, their guesses are likely to be much closer than that of a stranger. Nevertheless, there is no certainty that, with respect to any individual lot, the grades credited growers by this method even closely approximate the grades which the lot actually contained. It appears that the determination of grades based upon samples taken at the washer is likely to be more accurate than either of the two methods mentioned above.

Once the grades of the by-products fruit are determined, the next problem is to fix the rates of payment for each grade. The general practice among associations which have settled for by-products fruit on the basis of grade has been to pay the same rate for the same grade of fruit sent to the products plant that is paid for the fruit of that grade which is shipped. The usual procedure is to combine within each grade pool both the fruit shipped and the fruit sent to the products plant, and to divide the total net returns from that grade among the several growers irrespective of the disposition of each grower's fruit. In this case the money used to pay the loss on by-products fruit is derived solely from the sale of the particular grades which were also sent to the products plant. Thus the loss on Standards is borne entirely by those growers who produced a larger-than-average proportion of Standards, while the loss on Choice is borne entirely by those growers who produced a larger-than-average proportion of Choice.

When there are more lemons available for shipment than can be shipped, it is desirable, from the standpoint of the largest total returns to the association, to confine the shipments to the fruit which is highest in price and to send the lower-priced fruit to the products plant. Since at any given time Extra Choice fruit commands a premium over Choice, while Choice fruit commands a premium over Standards, the bulk of the merchantable by-products fruit consists of Standard and Choice grades.

Granting the desirability of sending the lower grades to the products plant in years when all of the merchantable fruit cannot be marketed, it does not necessarily follow that the loss on such fruit should be borne entirely by the growers who produced a larger-than-average proportion of those grades. Did not the withholding of those grades from the market result in a higher price for the better grades? The answer to this question is definitely in the affirmative. The withholding of any particular grade of lemons from the market not only results in a higher price for the lemons of that grade which are shipped, but also results in a higher price for each of the other grades. The effect, however, is somewhat more pronounced upon the price of the particular grade than upon the prices of the other grades.

The statement is sometimes made that the only grades sent to the products plant are those which are not worth shipping. To the extent that that is correct, no loss is incurred on such fruit. If an association can secure as large or larger net returns for a given grade of fruit sent to the products plant as it could if such fruit were shipped, no loss is entailed by so doing, and no grower

is paid less than the market value of his fruit. But when certain grades are sent to the products plant which, if they had been shipped and the same volume of other grades withheld, would have brought more than the by-products returns, then it cannot be said that when the growers of such grades receive only the by-products price they are being paid in accordance with the market value of their fruit.

A possible solution of this problem is to calculate the price differentials between grades on the basis of a simple average of the prices of the several grades on the same markets on corresponding days. This method has already been discussed. For purposes of illustration let us assume the following simplified situation. During a given time pool an association received from its growers the following amounts of lemons in equivalent packed boxes:

Extra Choice	1,000
Choice	500
Standard	400
Culls	100
Total	2,000

The disposition was as follows:

	Shipments	By-products
Extra Choice	1,000	0
Choice	400	100
Standard	100	300
Culls	0	100
Totals	1,500	500

The net amount of money dollars received for the fruit shipped was as follows:

Extra Choice	\$2,000
Choice	600
Standard	100
Total	\$2,700

When calculated on the basis of a simple average of prices on corresponding days, the price differential between Extra Choice and Choice was \$0.75 a packed box and between Extra Choice and Standard, \$1.50 a packed box.

The rates of payments could then be calculated by substituting the appropriate values in the following equation and solving:

$$\underline{Xa} + (\underline{X} - \underline{Y})\ \underline{b} + (\underline{X} - \underline{Z})\ \underline{c} = \underline{V}$$

Where $\underline{X}$ equals the rate on Extra Choice, $\underline{Y}$ equals the price differential between Extra Choice and Choice; $\underline{Z}$ equals the price differential between Extra Choice and Standard; $\underline{a}$, $\underline{b}$, and $\underline{c}$ equal the number of units of Extra Choice, Choice, and Standard, respectively; and $\underline{V}$ equals the total net returns from the fruit shipped.

By substituting the appropriate values in the above equation we have:

$$1{,}000\ \underline{X} + (\underline{X} - 0.75)\ 500 + (\underline{X} - 1.50)\ 400 = 2{,}700$$

Solving the equation shows the value of $\underline{X}$ to be 1.9342. The rates of payment are, therefore, as follows: Extra Choice \$1.9342; Choice \$1.1842; and Standard \$0.4342. When the returns from by-products are received, the 100 boxes of cull fruit would be paid the average price per unit and the remaining money would be distributed over all of the merchantable fruit.

Under the system in which each grade bears the entire loss on the fruit of that grade sent to the products plant, the rates of payment would be as follows: Extra Choice $2.00; Choice $1.20; and Standard $0.25. The returns from by-products when received would be distributed in accordance with the volume of each grade sent to the products plant.

Under the system in which all the fruit sent the products plant is for the individual grower's account, the rates of payment on fruit shipped would be as follows: Extra Choice $2.00; Choice $1.50; and Standard $1.00. On Choice and Standard fruit sent to the products plant the rates of payment would be only the by-products return.

Contribution to the Shipping Allotment.-- Under the Exchange Lemon Agreement, the total quantity deemed advisable to ship is divided among the member associations on the basis of the amount of fruit which each has in storage. The storage counts are made as of the first and fifteenth of the month. No association, however, divides its shipping allotment among its growers on the basis of the amount of fruit which each of its growers has in storage. To do so would not only tend to reduce the total gross returns received by the association but would also greatly increase the costs of operation. The effect of not doing so, however, is at times to ship one grower's fruit on the allotment received on another grower's fruit and the latter eventually going to the products plant.

The problem here is related to the length of time the fruit can be held in storage rather than to its grade. In general, the keeping quality of lemons is closely associated with the color classifications into which they are sorted after being washed. Dark-green lemons can be held in storage the longest, followed by light green, silver, and yellow, in the order named.

One method of determining whether lemons of one color classification have been shipped on the prorate of another is to compute the ratios of the total shipments of each color classification during a given time pool to the cumulative volume of the same color classification in storage on the first and fifteenth of each month in the time pool. Suppose, for example, the following situation is found to have occurred. (All units are expressed in equivalent packed boxes, and only merchantable fruit is included.)

Color classification	Cumulative volume in storage	Total shipments	By-products
Dark green	1,000	100	0
Light green	700	100	0
Silver	500	80	20
Yellow	300	50	50

The ratios of total shipments to cumulative volumes in storage are as follows: dark green, 10 per cent; light green, 14.3 per cent; silver, 16.0 per cent; and yellow, 16.7 per cent. It is evident in this illustration that, although all of the dark and light-green fruit was shipped while only 80 per cent of the silver and only 50 per cent of the yellow were shipped; none of the shipments of dark and light green were on the prorates of silver or yellow. In fact just the reverse was the case. Some of the shipments of both silver and yellow were made on the prorates of the greens.

On the other hand, if only 20 boxes of yellow had been shipped and 80 boxes had been sent to the products plant, the ratio would have been only 6.7 per cent. In this case a part of the shipments of some of the other color classifications

would have been on the yellow prorate. If the yellow lemons are to be compensated, it is necessary to determine both the number of boxes for which they are to receive compensation and the rate of compensation per box.

The number of boxes of under- and overshipments of each color classification can be determined from the calculated ratios. The following situation is assumed:

Color classification	Ratio	Deviation from average
Dark green	10.0	- 1.8
Light green	14.3	+ 2.5
Silver	16.0	+ 4.2
Yellow	6.7	- 5.1
Average	11.8	

It appears that, although the ratio for dark-green lemons is below the average, no additional compensation is required since all the dark green was shipped. However, dark green should not be assessed to provide compensation for yellow. To bring the ratio for yellow up to 11.8 per cent would require the shipment of an additional 15 boxes.

The rate of compensation per box on yellow could be based upon the average net price received for the yellow of comparable quality shipped, less the estimated return from by-products. Suppose that this amounts to $1.00 per packed box. The yellow lemons are therefore entitled to an additional $15.00. This $15.00 should be secured from the returns on the shipments of light-green and silver lemons; $\frac{2.5}{6.7}$ from light green and $\frac{4.2}{6.7}$ from silver.

From the standpoint of practical operation it would simplify matters to establish an index based upon the normal length of time each color classification can be kept in storage and still be counted in the determination of the shipping allotment. Suppose, for example, it is found that each color classification can normally be kept for the following storage-count periods: dark green 10; light green 7; silver 5; and yellow 3.

With respect to contributions to the shipping allotment, the index would then be as follows: dark green 100 per cent; light green 70 per cent; silver 50 per cent; and yellow 30 per cent. If it is found that at the end of a given time pool the above percentages of the fruit in each of the color classifications have been shipped no adjustments for prorate contributions are required. On the other hand, if it is found that 100 per cent of the dark green, 70 per cent of the light green, 60 per cent of the silver, and 20 per cent of the yellow have been shipped, then an upward adjustment on yellow of 10 per cent is required which should be taken from the overshipments of silver.

Such a procedure would probably require the establishment of separate pools for each color classification. Grade pools would then be essentially subpools within each color classification.

From the standpoint of both types of adjustments on merchantable lemons sent to the products plant, either of two viewpoints may be taken: (1) that after adjustments have been made between color pools, from the standpoint of contributions to the shipping allotment, any further adjustments needed from the standpoint of contributions to the increased prices of fruit shipped should be within each color-pool, but not between fruit in different color pools; (2) that in addition to

adjustments between the fruit in different color pools from the standpoint of prorate contributions, further adjustments between the color classifications as well as within each color pool may be required.

Payments to growers in accordance with the inherent characteristics of their fruit could, it appears, be fully accomplished under the first. Fruit of a long storage life has wider market opportunities than fruit of a short storage life. The former fruit can be shipped at any time that the latter can be shipped, and in addition can be shipped when the latter is no longer fit for fresh consumption. If fruit with a short storage life is given, in effect, its prorata share of the available market during the time it is merchantable, it probably receives all that it is worth from a market standpoint. The fact that some of the fruit so deteriorated in quality before it could be shipped under its prorate that it was no longer fit for fresh consumption does not in itself justify compensation above the by-product's returns. 15/ There is, however, the necessity for making adjustments between the different grades within each color pool. This type of adjustment has already been discussed.

Compliance with the second viewpoint mentioned above would tend to result in paying growers whose fruit is sent to by-products more than the market value of such fruit.

Conclusions with Respect to Grade Pools

A substantial variation exists between growers in the Santa Paula Citrus Fruit Association in the proportions of the several grades contributed to a given time pool. Over a period of years the fruit of some growers consistently contains a larger proportion of the higher-priced grades than does the fruit of other growers. On the same markets on the same days, Extra Choice consistently brings a higher price than Choice, while Choice consistently brings a higher price than Standard. Under these conditions, the establishment of separate pools for each grade appears to be the only certain way of assuring that the returns paid the individual growers, either for a given time pool or over a period of several years, will fully reflect the average differences in the market value of their fruit arising from the differences in quality.

In the Santa Paula Citrus Fruit Association, which packs from trays, each ndividual lot is kept entirely separate until after it has been graded and the umber of units of each grade determined. Thus each grower is credited with the recise grades which his fruit contained at the time it was graded. In asso-iations which pack from belts, tubs, or bins, the number of units of each grade s determined only after the fruit has been packed. The large lots are kept ufficiently separate until after they have been packed to provide a very close pproximation to the actual number of units of each grade in such lots. This, owever, is not done with small lots, because of the expense that it would entail. nstead, several of the small lots, those containing usually 50 storage boxes and ess, are combined prior to grading and run as one lot. In most cases the grades btained from the combination lot are simply prorated among the several growers n the basis of the number of storage boxes which each had in that combination ot. In such cases fruit in combination lots is not pooled on the basis of grade. n order to pay growers having any significant proportions of their fruit in small

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15/ It is assumed that the fruit in each color classification is stored nder equally favorable conditions, and that there is ample storage space for ll of the fruit.

lots in accordance with the particular grades of their fruit, the number of units of each grade must be determined between grading and packing, unless each grower's grade credits are determined from samples. When grading on belts and packing from belts, tubs, or bins, the installation of an automatic weighing device, or in the case where mechanical sizers are employed the installation of counters, between the grading and packing equipment may enable this to be done. Thus far, however, neither method has been tried, and until some experience has been had with them no definite conclusion can be reached.

The grades obtained at the time the fruit is graded depend upon the length of time it has been held in storage and the conditions under which it was held as well as by its inherent characteristics. In years of excessive supplies some growers may secure relatively large gains while other growers may experience substantial losses by reason of the differences in the length of time between delivery and grading of their respective fruit. Adequate handling of this problem necessitates the employment of some method for determining the grades of the individual lots which are held in storage beyond their prime prior to the time the fruit begins to deteriorate in grade. The determination of the grades on the basis of samples may afford a solution to this problem. This is not certain, but it appears to offer sufficient promise to justify some experiments.

In determining the money credits to growers, the use of a simple average of the price differentials between the several grades on the same markets on corresponding days has some advantages over the use of weighted-average prices by grades, although it would involve somewhat more clerical work. For a given time pool, the weighted-average price of Standard may be above the weighted-average price of Extra Choice, yet at all times during that period the price of Standards may have been considerably below the price of Extra Choice.

Fruit manufactured into by-products, which was one time merchantable, contributed to the price received for fruit shipped by reason of having been withheld from the market. Also fruit in certain color classifications sent to the products plant may have contributed to the shipping allotment received by an association (under the Exchange Lemon Agreement) on which fruit in other color classifications was shipped. It appears feasible to make appropriate adjustments in both types of cases.

SIZE POOLS

Packed lemons, which constitute the bulk of the lemons destined for fresh consumption, are sold on the basis of size as well as on the basis of grade. Large lemons are packed in both the standard box and the jumbo box. 16/ Smaller lemons are packed only in the standard box. Throughout this report the term "size" will refer to the number of lemons contained in a standard packed box, unless the words "jumbo box" are specifically mentioned in connection therewith. The standard sizes of lemons are as follows: 180's, 210's, 240's, 270's, 300's, 360's, 432's, 490's, 540's, and 588's. Lemons smaller than 588's are usually termed "lemonettes."

In the Santa Paula Citrus Fruit Association, lemonettes are sorted out at the washer by means of a mechanical sizer and are pooled separately. The remaining lemons are pooled by grade but not by size within a grade pool. Each grower receives the same price per pound for the same grade of lemons irrespective of the particular sizes of his lemons in that grade. This was formerly the practice employed by all lemon cooperative packing associations. In recent years, however, numerous associations have been pooling, at least to some extent, on the basis of size. Some associations pool each size separately; others group the sizes in various combinations.

Division of Total Net Returns between Growers With and Without Size Pools

As in the case of pooling on the basis of grades, whether or not there would be any difference in the division of the total net returns among the individual growers with size pools from that without size pools depends upon (1) the extent of the variation between growers in the proportions of the several sizes of a given grade contributed during the period under consideration and upon (2) the extent of the differences between the average selling prices of the several sizes of that grade for the specified period of time.

Variations between Growers in the Proportions of the Several Sizes Contributed.-- Since the Santa Paula Citrus Fruit Association has not employed size pools, records are not available on the nature and extent of the variations between its growers in proportions of the several sizes of each of the different grades delivered during specific pooling periods and over a period of several years. Some data, however, were secured from associations which have pooled on the basis of size.

Table 13 shows the extent of the variation between 25 growers in the proportions of the several sizes of Extra Choice lemons contributed to a given time pool in 1933-34. With the exception of 210's and 240's, there was substantial variation in the proportions of each of the sizes. The greatest variation was in 300's. The detailed records of 4 of the 25 growers are shown in table 14. It will be noted that the fruit of grower No. 11 ran heavily to small sizes, while the fruit of grower No. 15 ran heavily to large sizes. Even though the average size of the fruit was nearly the same for grower No. 12 and grower No. 16, there was a significant difference in the proportions of 360's.

Tables 15, 16, and 17 show the extent of the variation between 12 growers in the proportions of Extra Choice, Choice, and Standard lemons respectively con-

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16/ After 1935-36, it is understood that most of the local lemon associations affiliated with the California Fruit Growers Exchange will abandon the jumbo box.

Graded lemons, which constitute the bulk of the lemons destined for fresh consumption, are sold on the basis of size as well as on quality or grade. Large lemons are packed in both the standard box and the jumbo box, but smaller lemons are packed only in the standard box. Throughout this report the term "size" will refer to the number of lemons contained in a standard packed box, unless the words "jumbo box" are specifically mentioned in connection therewith. The standard sizes of lemons are as follows: [illegible]'s, 210's, 240's, 270's, 300's, [illegible]'s, 360's, [illegible]'s, [illegible]'s, 490's, and [illegible]'s. Lemons smaller than [illegible]'s are usually termed "[illegible]."

In the Santa Paula Citrus Fruit Association, lemons are sorted out of the water by means of a mechanical sizer and are packed separately. The members' lemons are pooled by grade but not by size within a grade pool. Each grower receives the same price per pound for the same grade of lemons irrespective of the particular sizes of his lemons in that grade. This was formerly the practice followed by all lemon cooperative packing associations. In recent years, however, the other associations have been pooling, at least to some extent, on the basis of size. Some associations pool each size separately; others group [illegible] [illegible].

Variation of Total Net Returns between Growers With and Without Size Pools

As in the case of pooling on the basis of grades, whether or not there would be any difference in the division of the total net returns among the individual growers with size pools from that without size pools depends upon (1) the extent of the variation between growers in the proportions of the several sizes of a given grade contributed during the period under consideration and (2) the extent of the differences between the average selling prices of the several sizes of that grade for the specified period of time.

Variation between growers in the proportions of the several sizes delivered.[1]— Since the Santa Paula Citrus Fruit Association does not pool by sizes, records are not available on the nature and extent of the variation between the growers in proportions of the several sizes of each of the different grades delivered during specific packing periods and over a period of several years. Some data, however, were secured from associations which have pooled on the basis of size.

Table 13 shows the extent of the variation between 26 growers in the proportions of the several sizes of Extra Choice lemons contributed to a given size pool in 1932-33. With the exception of 210's and 540's, there was substantial variation in the proportions of each of the sizes. The greatest variation was in 300's. The detailed records of 4 of the 26 growers are shown in table 14. It will be noted that the fruit of grower No. 11 ran heavily to small sizes, while the fruit of grower No. 16 ran heavily to large sizes. Even though the average size of the fruit was nearly the same for grower No. 12 and grower No. 16, there was a significant difference in the proportions of 300's.

Tables 15, 16, and 17 show the extent of the variation between 12 growers in the proportions of Extra Choice, Choice, and Standard lemons [illegible] [illegible]

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[1] After 1932-33, it is understood that most of the local lemon associations affiliated with the California Fruit Growers Exchange pool according to [illegible] [illegible].

TABLE 13

Extra Choice Lemons: Association A; Variation as between Growers in the Proportions of the Several Sizes Contributed to a Given Time Pool in 1933-34

Size	Mean	Standard deviation
	per cent	per cent
210's	0.1	0.4
240's	0.5	0.8
270's	2.2	6.2
300's	26.6	9.7
360's	36.4	7.2
432's	17.2	5.1
490's	9.7	4.3
540's	5.3	3.7
588's	2.0	3.8

TABLE 14

Extra Choice Lemons: Association A; Proportions of the Several Sizes Contributed to a Given Time Pool in 1933-34 by Four Growers

Sizes	Percentage of total boxes contributed by			
	Grower No. 11	Grower No. 15	Grower No. 12	Grower No. 16
1	2	3	4	5
number per box	per cent	per cent	per cent	per cent
210	0.2	0.0	0.0	0.0
240	0.0	0.5	0.0	2.0
270	0.2	32.4	0.0	2.0
300	6.3	43.9	22.4	25.3
360	19.3	16.2	42.5	35.6
432	21.1	5.8	19.3	20.5
490	17.6	1.2	11.0	11.7
540	17.3	0.0	3.6	2.9
588	18.0	0.0	1.2	0.0
Total	100.0	100.0	100.0	100.0
Average number of lemons per box	466	310	384	376

TABLE 15

Extra Choice Lemons: Association B; Variation as between Growers in the Proportions Contributed to Each Size Pool by Years 1929-30 to 1934-35

Year November-October	270's and larger		300's		360's		432's and smaller	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent
1929-30	12.7	4.2	41.5	4.3	36.4	4.8	9.4	4.0
1930-31	12.6	6.2	47.6	6.6	33.0	8.2	6.8	4.9
1931-32	11.7	6.7	40.2	8.4	37.8	10.3	10.2	6.5
1932-33	7.0	5.1	44.6	6.8	35.4	6.2	13.0	6.1
1933-34	11.1	6.1	42.2	7.9	36.2	8.4	10.4	5.2
1934-35	10.2	5.9	37.1	9.1	37.0	6.2	15.8	11.1
Average	10.9	5.0	42.2	5.9	36.0	5.9	10.9	5.4

TABLE 16

Choice Lemons: Association B; Variation as between Growers in the Proportions Contributed to Each Size Pool, by Years 1929-30 to 1934-35

Year November-October	270's and larger		300's		360's		432's and smaller	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent
1929-30	5.1	2.0	26.9	5.1	47.6	3.1	20.4	6.0
1930-31	7.7	4.7	31.4	12.8	54.3	15.6	6.6	3.1
1931-32	5.7	4.0	27.4	10.2	51.0	9.0	15.8	7.8
1932-33	3.4	3.4	28.2	10.2	50.9	8.7	17.5	9.1
1933-34	5.5	5.0	22.3	9.4	52.7	8.3	19.6	10.5
1934-35	5.2	3.1	26.3	8.3	50.0	4.8	18.5	7.8
Average	5.4	3.2	27.1	8.6	51.1	6.2	16.4	5.9

TABLE 17

Standard Lemons: Association B; Variations as between Growers in the Proportions Contributed to Each Size Pool, by Years, 1929-30 to 1934-35

Year November-October	270's and larger		300's		360's		432's and smaller	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent
1929-30	1.2	1.5	16.8	11.0	42.0	5.1	40.0	13.4
1930-31	1.6	2.1	18.4	8.2	48.6	9.7	31.5	13.2
1931-32	5.4	8.1	19.4	15.5	47.8	21.5	27.5	19.3
1932-33	2.3	4.6	26.6	12.9	40.1	9.1	31.0	16.1
1933-34	0.0	0.0	9.3	12.9	48.7	19.3	42.0	22.8
1934-35	6.5	11.3	24.5	19.0	37.6	21.0	31.4	26.1
Average	2.8	2.8	19.2	8.6	44.0	6.4	34.0	7.6

TABLE 18

Extra Choice Lemons: Association B; Comparison of Percentages of Shipments in Each Size Pool of 12 Growers with Average, 1929-30 to 1934-35

Number of years above average	Size pools			
	270's and larger	300's	360's	432's and smaller
	number of growers	number of growers	number of growers	number of growers
6	3	3	2	3
5	0	0	3	1
4	2	2	0	0
3	1	2	1	2
2	2	2	2	1
1	1	1	2	0
0	3	2	2	5
Total	12	12	12	12

tributed to each size pool in each year from 1929-30 to 1934-35. Within each grade the variation in sizes in each of the six years was considerable. Over the six-year period the average variation tended to be less than in any single year, but was nevertheless significant.

Not only did some growers' fruit consist of a larger proportion, on the average, of large, medium, or small sizes than did the fruit of other growers, but the fruit of some growers consistently ran heavily to large sizes while the fruit of other growers consistently ran heavily to small sizes. This is shown in table 18. Also, some growers consistently produced fruit containing more than the average percentage of 300's or of 360's while other growers consistently produced fruit containing less than the average percentage of these sizes.

The above evidence indicates that during any given pooling period and over a period of several years there is likely to be substantial variation between growers in the proportions of the several sizes, except the very largest, of each of the different grades delivered. The extent of the variation in any given year tends to be greater than the average variation over a period of several years. The latter, however, is substantial.

Differences between the Prices of the Several Sizes of the Same Grade of Lemons.-- This part of the report deals mainly with an analysis of the price differentials between the more important sizes of Extra Choice lemons sold at auction in New York City during the period, November, 1930, to August, 1936. The data were computed to show the differentials between the prices of 360's and each of the other sizes from 240's to 588's, inclusive. These price differentials were then analyzed from the standpoints of (1) the averages for a given year, (2) the averages for the five-year period, 1930-31 to 1934-35, (3) the trends since 1930-31, and (4) the seasonal variation.

The tendency is for the price differentials between the several sizes to be continually changing from month to month, rather than to remain constant. This is illustrated in table 19. Certain sizes, however, tend to sell at a premium, while other sizes tend to sell at a discount.

Table 20 shows the annual average price differentials between 360's and each of the other sizes of Extra Choice lemons at New York each year from 1930-31 to 1934-35. In each of these five years there were differences between the prices of the several sizes, except with respect to (1) the prices of 300's and 360's in 1932-33, and (2) the prices of 270's and 300's in 1934-35. For the five-year period, the prices of 270's and 300's averaged the same. 17/ There were substantial differences, however, between the average prices of each of the other sizes. On the average, 270's and 300's commanded a premium over 360's, while each of the other sizes sold at a discount. The average discount was smallest on 240's. Of the sizes smaller than 360's the average discount was least on 432's and greatest on 588's. The tendency is for the differences in prices between the intermediate sizes to be relatively small and for the differences between the prices of the small sizes to be relatively large.

Two trends are apparent in table 20: (1) for the large sizes instead of selling at a premium over 360's to sell at a discount; and (2) for the discount on the small sizes to narrow, but not to disappear.

17/ However, since 270's were packed in jumbo boxes and 300's in standard boxes, it is likely that if both sizes had been packed in the same boxes, 300's would have commanded a premium over 270's. Roughly, lemons packing a given size in jumbo boxes will pack the next larger size in standard boxes.

TABLE 19

Extra Choice Lemons, New York Auction Market Differentials between Prices of 360's and Each of the Other Sizes from 240's to 588's, by Months, 1933-34

Month	240's*	270's*	300's	432's	490's	540's	588's
	dollars per box	dollars per box	dollars per box	dollars per box	dollars per box	dollars per box	dollars per box
November	+0.09	+0.53	+0.76	-0.73	-0.92	-1.27	-1.70
December	-0.03	+0.27	+0.31	-1.25	-1.32	-1.23	--
January	-0.04	+0.13	+0.12	-0.02	-0.08	-0.28	-0.44
February	-0.40	-0.28	-0.45	-0.30	-0.82	-1.39	--
March	-0.57	-0.28	-0.44	+0.03	-0.02	--	--
April	-0.49	-0.47	-0.56	-0.32	-0.48	-0.70	-1.15
May	-0.37	-0.06	+0.03	-0.41	-0.54	-0.75	-0.70
June	-0.62	-0.35	-0.11	+0.21	+0.20	+0.53	+0.37
July	-0.60	-0.40	+0.01	+0.02	-0.23	-0.07	-0.08
August	-0.47	-0.27	-0.06	+0.01	-0.08	-0.30	-0.36
September	+0.21	+0.50	+0.45	-0.90	-1.37	-1.26	-1.99
October	+0.11	+0.81	+0.80	-1.54	-1.98	-2.57	-2.67
Average	-0.26	+0.01	+0.07	-0.43	-0.64	-0.84	-0.97

* Jumbo boxes.

TABLE 20

Extra Choice Lemons, New York Auction Market: Average Differentials between Prices of 360's and Each of the Other Sizes from 240's to 588's, by Years, 1930-31 to 1935-36

Year November-October	240's*	270's*	300's	432's	490's	540's	588's
	dollars per box	dollars per box	dollars per box	dollars per box	dollars per box	dollars per box	dollars per box
1930-31	+0.12	+0.43	+0.38	-0.49	-0.96	--	-2.01
1931-32	+0.14	+0.34	+0.24	-0.35	-0.76	-1.72	-2.42
1932-33	-0.24	-0.11	0.00	-0.29	-0.49	-0.82	-0.95
1933-34	-0.26	+0.01	+0.07	-0.43	-0.64	-0.84	-0.97
1934-35	-0.14	-0.03	-0.03	-0.10	-0.19	-0.32	-0.41
Average	-0.08	+0.13	+0.13	-0.33	-0.61	-0.92	-1.35
1935-36 November-August	-0.88	-0.53	-0.22	-0.18	-0.55	-0.76	-1.02

* Jumbo boxes.

Much the same general situation which has existed with respect to the price differentials between the several sizes of Extra Choice lemons has also prevailed with respect to the price differentials between the sizes of both Choice and Standard lemons. This is illustrated in table 21. It should be noted, however, that the discounts on the small sizes in 1933-34 were considerably less in the case of Standard lemons than of Extra Choice lemons.

During the five years 1930-31 to 1934-35 there were fairly definite seasonal variations in the price differentials between 360's and each of the other sizes. This is shown in table 22. As compared with the prices of 360's, the prices of large lemons tended to be relatively higher in the winter than in the summer months, while the prices of smaller lemons tended to be relatively higher in the summer than in the winter months.

The foregoing analysis does not forecast with any great degree of certainty the extent to which the prices of the several sizes will differ during the next several years. A number of distinct tendencies, however, are discernible: (1) The differentials between the prices of the several sizes are likely to continue to fluctuate rather sharply from month to month and from year to year rather than to remain constant. (2) Over a period of years the prices of the intermediate sizes are likely to average above the prices of both the large sizes and the small sizes. (3) On the average, the differentials between the prices of the intermediate sizes are likely to be small, whereas the average differentials between the prices of the large sizes and between the prices of the small sizes are likely to be substantial.

Differences in Returns to Individual Growers without Size Pools as Compared with Pooling on the Basis of Sizes.-- Table 23 is designed to show the differences in returns per packed box to 25 individual growers under three different size pool arrangements as compared with separate pools for each size. In column 1 all sizes of Extra Choice lemons are combined in one pool; in column 2 all sizes from 180's to 490's, inclusive, are combined in one pool while the 540's and 588's are placed in a second pool; and in column 3 the 270's and larger are placed in one pool, the 300's in a second pool, the 360's in a third pool, and the 432's and smaller in a fourth pool. It will be noted that, without size pools, only 52 per cent of the growers would have received within 5 cents a packed box of the same price that they would have obtained with separate pools for each size, whereas with two size pools, 72 per cent of the growers would have been in this class, and with four size pools, 96 per cent of the growers would have been included.

In calculating the data given in table 23, the percentages of each size shipped by 25 growers in a given time pool in 1933-34 and the average price differentials between the several sizes for the five years 1930-31 to 1934-35 were used. The use of the five-year average price differentials is entirely appropriate, but the use of the percentages of each size shipped in only one year exaggerates the average differences in returns to growers over a period of several years. It has already been shown that the variation between growers in the proportions of the several sizes contributed tends to be less over a period of years than in any given year. A careful study of the shipments by sizes of the 12 growers in Association B from 1929-30 to 1934-35 shows that although a grower may have had either extremely large or extremely small sizes in one year, he did not average such extreme sizes over a period of several years. 18/

18/ The 12 growers in Association B were selected so as to include the extreme cases. The sample is a selected rather than a random one.

TABLE 21

Lemons, New York Auction Market: Average Differentials between Prices of 360's and Each of the Other Sizes from 240's to 588's, by Grades, 1933-34

Size	Extra Choice	Choice	Standard
	dollars per box	dollars per box	dollars per box
240's*	-0.26	-0.28	-0.32
270's*	+0.01	-0.01	-0.29
300's	+0.07	+0.14	+0.03
432's	-0.43	-0.29	-0.15
490's	-0.64	-0.36	-0.05
540's	-0.84	-0.46	-0.18
588's	-0.97	-0.74	-0.28

* Jumbo boxes.

TABLE 22

Extra Choice Lemons, New York Auction Market: Seasonal Variation in Relative Differentials between Prices of 360's and Each of the Other Sizes from 240's to 588's, 1930-31 to 1934-35

Month	240's*	270's*	300's	432's	490's	540's	588's
	per cent	per cent	per cent	per cent	per cent	per cent	per cent
November	108.0	111.2	109.7	97.7	97.2	95.4	88.4
December	104.0	102.1	101.4	99.0	99.5	89.0	83.1
January	104.0	102.7	100.0	102.4	106.9	100.3	106.2
February	110.0	109.2	105.0	98.3	98.7	93.8	97.3
March	107.0	105.4	98.6	109.4	117.2	139.7	138.8
April	107.0	103.8	98.8	102.4	102.3	100.3	96.7
May	98.0	96.9	98.1	100.2	100.1	97.7	104.1
June	89.0	89.4	95.0	102.8	103.6	106.5	128.6
July	89.0	88.2	94.0	103.4	102.3	108.7	110.9
August	89.0	90.1	95.0	102.1	101.8	107.3	96.7
September	96.0	97.7	99.0	93.7	87.5	88.4	79.3
October	99.0	103.3	105.4	88.6	82.9	72.9	69.9

* Jumbo boxes.

TABLE 23

Extra Choice Lemons: Frequency Distribution of Differences in Returns per Packed Box to 25 Growers with No Size Pools, Two Size Pools, and Four Size Pools, as Compared with Separate Pools for Each Size*

Class interval	With no size pools	With two size pools	With four size pools
	1	2	3
cents per box	number of growers	number of growers	number of growers
0 to 5	13	18	24
6 to 10	5	4	0
11 to 15	5	2	0
16 to 20	0	1	1
21 and over	2	0	0
Total	25	25	25

* Based upon shipments by sizes of 25 growers in 1933-34 and average price differentials between the several sizes at New York from 1930-31 to 1934-35.

TABLE 24

Extra Choice Lemons: Frequency Distribution of Estimated Differences in Returns per Packed Box to 12 Growers with No Size Pools as Compared with Separate Pools for Each Size, Average 1930-31 to 1934-35

Class interval in cents per box	Number of growers
0 to 5	8
6 to 10	4
11 to 15	0
Total	12

Of the 2 growers in column 1, table 23, in the class interval 21 cents and over, 1 had 40 per cent more and the other 27 per cent less in the size group 432's and smaller than the average of the 25 growers. Among the 12 growers in Association B the greatest deviation from the average percentage of 432's and smaller in any one of the six years 1929-30 to 1934-35 was 24 per cent. Over the six-year period, however, the deviation from the average for this grower was only 9 per cent. Table 24 is designed to show, over the five years 1930-31 to 1934-35, the average differences in returns per packed box to the 12 growers in Association B without size pools as compared with each size pool separated. In this table it will be noted that differences in returns to growers are not nearly as wide as those shown in table 23, column 1. If the trends with respect to the price differentials between the sizes continue, the average differences in returns to individual growers over the next several years, with one rather than another of the various size pool arrangements, are likely to be less than the average differences for the past several years. As nearly as can be determined from the available data, the placing of all sizes 490's and larger in one pool and 540's and 588's in a second pool would result in all growers receiving over a period of several years within 5 cents a packed box of the price that they would receive if each size were pooled separately. In any one year, however, some growers may receive considerably more or less than 5 cents a packed box of that price. The differences in average returns to growers over a period of years with four size pools as compared with each size pooled separately are likely to be negligible, while in any given year no appreciable differences are likely to occur except in the most extreme cases. On the other hand, the combining of all sizes of each grade in a single pool is likely to result in some growers being paid considerably more and other growers being paid considerably less over a period of several years than the market value of their fruit.

Determination of the Number of Units of Each Size Contributed by Individual Growers

If each grower is to be credited with the number of units of each of the several sizes which the fruit of a given grade that he contributed to a time pool actually contains, the same requirements must be met that were outlined in the case of grade pools, namely:

1. The sorting must be done in such a way that all the lemons in each of the separate classifications are reasonably uniform in size and that the average size of the lemons in one classification is significantly different from the average size in another.

2. The sorting must be reasonably uniform as between the fruit of the several growers.

3. The fruit of each grower must be sorted separately.

4. The number of units of each size must be determined before one grower's fruit has become commingled with that of other growers.

The first two of these requirements offer no serious difficulties and appear to be met satisfactorily by most associations. All associations irrespective of whether they employ size pools or not, sort the lemons sold as packed fruit into size classifications which are precisely defined and universally accepted. The particular size of lemons in a packed box is plainly marked on the outside of the box and the packed lemons are sold by the association on the basis of size as well as on the basis of grade.

The size of lemons is determined by the number of lemons packed in accordance with definite patterns in a standard box. 19/ A standard packed box may contain any one of the following number of lemons: 180, 210, 240, 270, 300, 360, 432, 490, 540, and 588. It never, however, contains a number in between those numbers, except that 442's are sometimes packed.

The lemons are sorted into the several sizes by the packers in the process of packing. The sorting is done by inspection rather than by mechanical means. When packed by experienced people under careful supervision, reasonable uniformity is maintained with respect to (1) the sizes of the individual lemons in a particular box and (2) the average size of the lemons in different boxes containing the same number of lemons. If the sorting by size is sufficiently uniform so that buyers do not discriminate between boxes containing the same number of lemons of the same quality, it is also sufficiently uniform for the purpose of pooling.

Since all packed lemons are sorted by size in the process of packing, the question arises why pooling on the basis of these same size classifications involves any additional expense other than for accounting. The reason is to be found in the third and fourth requirements mentioned above. For the purpose of marketing, it is only necessary that all of the lemons be packed by size, but for the purposes of pooling on the basis of size, it is necessary to determine separately the sizes of each grower's fruit. The cost of keeping each grower's fruit entirely separate until after it has been packed and the number of boxes of each size recorded is apparently so great that as far as we have been able to learn, no association with numerous members actually does it.

The customary practice among associations packing from trays is to keep each grower's fruit entirely separate until after it has been graded and weighed, but thereafter the identity of the individual lot is no longer maintained. Although each grower's packed fruit is eventually sorted by size in the process of packing, the sizes thus obtained are not used as the basis for pooling, since there is no means of determining which grower's fruit is contained in each packed box.

Associations packing from belts, tubs, or bins generally employ size pools for the Extra Choice and Choice grades. Standards, however, are seldom pooled on the basis of size. The usual practice is to credit growers with the total number of pounds of Standards without reference to the size of the fruit. In the case of the Extra Choice and Choice grades, each grower is credited with a definite number of boxes of each size or size group. Except in the case of large lots, however, there is no assurance that the sizes credited to each grower are the same as his fruit actually contained.

Determination of Sizes on Cleanups.-- Apparently the difficulty of estimating accurately the number of units of each size on the belts (or in the tubs and bins) at the end of the run of each lot is so great that most associations make no attempt to do it. Instead they merely credit each lot with the particular sizes in the boxes which reach the lidding machine immediately after the estimate. Thus, if the estimate shows that there are the equivalent of 15 packed boxes of Extra Choice lemons remaining on the packing belt and in the partially packed boxes, that lot is credited with the next 15 boxes of Extra Choice lemons which reach the lidding machine. The advantages of this method lie in its simplicity. It involves practically no additional labor either in the plant or in the office. At any particular

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19/ In addition to the standard box, a larger box known as the jumbo box is used for packing the large lemons.

The size of lemons is determined by the number of lemons required to properly fill a standard box. 13/ A standard packed box may contain any one of the following number of lemons: 180, 210, 240, 270, 300, 360, 392, 432, and 490. [illegible] except that [illegible] are sometimes packed.

The lemons are sorted into the several sizes by the packers in the process of packing. The sorting is done by inspection rather than by mechanical sizing. [illegible] is maintained with respect to (1) the sizes of the individual lemons for a particular box and (2) the average size of the lemons in different boxes containing the same number of lemons. If the sorting by size is sufficiently uniform so that lemons are not discriminated between boxes containing the same number of lemons of the same quality, it is also sufficiently uniform for the purposes of pooling.

Since all packed lemons are sorted by size in the process of packing, the question arises why pooling on the basis of three or more sizes [illegible] involve any additional expense other than for accounting. The answer is that [illegible] in the third and fourth quality [illegible]. For the purpose of marketing, it is only necessary that all of the lemons be graded in size, but for the purpose of pooling on the basis of size, it is necessary to determine separately the sizes of each grower's fruit. The cost of keeping each grower's fruit entirely separate until after it has been graded and the number of boxes of each size determined is apparently so great that as far as is known [illegible] lemons, [illegible]

The customary procedure in the case of these packing firms is to keep each grower's fruit entirely separate until after it has been graded [illegible], but thereafter the identity of the individual lot is no longer maintained. Although each grower's graded fruit is subsequently sorted by size in the process of packing, the sizes thus obtained are not used as the basis for pooling, since there is no means of determining which grower's fruit is contained in each packed box.

Associations packing fresh lemons [illegible] generally pool by size only for the Extra Choice and Choice grades. Standards, however, are seldom pooled on the basis of size. The usual practice is to credit growers with the total number of pounds of Standards without reference to the size of the fruit. In the case of the Extra Choice and Choice grades, each grower is credited with a definite number of boxes of each size or size group. Except in the case of large lots, however, there is no assurance that the boxes credited to each grower are the same as [illegible]

Method of determining sizes.--In computing the distribution of [illegible] the number of boxes of each size [illegible] and of the sum of each lot is so great that [illegible] Instead they merely credit each lot with the particular sizes in the boxes which reach the packing machine [illegible] after the [illegible]. Thus, if the [illegible] shows that there are the equivalent of 1½ packed boxes of Extra Choice lemons from [illegible] actually packed boxes, each lot is credited with the next 1½ boxes of Extra Choice lemons which reach the packing machine. The chief [illegible] of this method lies in its simplicity. It involves practically no additional labor [illegible] in the [illegible].

13/ In addition to the standard box, a [illegible] box known as the [illegible] is used for packing the larger lemons.

time the number of packed boxes of each size credited to all growers is in balance with the number actually packed. The disadvantages relate to the question of equity. There is no certainty that these boxes contain only the fruit of the grower to whom they are credited or in fact contain any of that grower's fruit. Consequently the sizes credited to the growers may be considerably different from the sizes of his fruit.

With a fairly large lot there could not be any material difference between the total number of boxes of each size credited to the grower under this system, and the total number of boxes of each size that would have been secured if the lot had been kept entirely separate. But with a small lot there could be a significant difference.

In order to at least partially overcome this difficulty in connection with small lots, some associations have, as far as seemed practical, avoided packing a lot running heavily to small sizes immediately after a lot running heavily to large sizes and vice versa. This procedure has merit, but it is questionable if even it results in each grower who has a considerable proportion of his fruit in small lots being credited with the precise sizes which they contained. The average difference over a period of years, however, would tend to be less than the difference in any given year.

Determination of Sizes in Combination Lots.-- Several individual lots containing only a few boxes each are combined in order to secure sufficient volume for economical operation when packing from belts, tubs, or bins. In most such cases the total number of boxes of each size or size group in each grade are simply prorated among the several growers on the basis of the number of units of that grade contributed by each. Thus each grower with fruit in a given combination lot is credited with the same proportions of the several sizes that such combination lot contained, irrespective of the sizes of his particular fruit. This in essence involves no pooling on the basis of sizes as far as the fruit in combination lots is concerned.

Some associations make an effort to avoid placing fruit markedly different in sizes in the same combination lots. To the extent that this is done, it tends to result in growers being paid more nearly in accordance with the particular sizes which they contributed. It is questionable, however, if even the use of this method justifies the implication given by the usual type of pool statement furnished growers that all of their fruit is pooled on the basis of sizes.

Mechanical Sizers and Counters.-- Several associations use mechanical sizers which provide some degree of presorting on the basis of size prior to packing. The question arises concerning the feasibility of installing counters in connection with the mechanical sizers along the same general lines as are employed in most orange cooperative packing associations, so that the number of units of each size in each individual lot can be precisely determined before that lot becomes commingled with other lots. Such a system is much more difficult to use for lemons than for oranges. The first difficulty arises from the fact that the sizers thus far developed sort the fruit on the basis of diameter only. The number of oranges in a standard packed box depends almost entirely upon the diameter of the oranges, since they are virtually round, but the number of lemons in a standard packed box depends not only upon the diameter of the lemons but also upon the length. Even though all of the lemons in a given lot have the same diameter, if they do not also have the same length, there will be considerable variation in size as measured by the number of lemons in a standard packed box. The second difficulty arises out of the somewhat rougher treatment to which the mechanical sizers and counters

subject the fruit. Lemons are more liable to damage from rough handling than are oranges. This difficulty, however, can probably be overcome by the use of protective devices.

By means of the present type of mechanical sizers each individual lot of lemons, however small, can probably be sorted separately on the basis of the diameter of the lemons without undue cost. The installation of counters in connection with the mechanical sizers will make it commercially feasible to record the number of lemons in each diameter group before one grower's fruit has become commingled with that of another grower. It should be recognized that under this system pooling is on the basis of diameter and that the pooling unit is the individual lemon. On the other hand, selling of packed fruit is on the basis of size as measured by the number of lemons in a standard box and the selling unit is a standard box. As a general proposition the basis of pooling and the pooling unit should, whenever possible, be the same as the basis of selling and the selling unit, respectively. The real question, therefore, is how closely does the division of any lot of lemons on the basis of the number of lemons in each diameter group approximate the division of the same lot of lemons on the basis of the number of packed boxes of each size. Evidence on this point is not now available. It could be secured, however, by means of carefully run tests.

In the event that the division is found to be the same under each system, the use of mechanical sizers and counters will insure that the returns of growers having small lots are based upon the particular grades and sizes which they contribute to a given time pool. That the same division will actually prevail, however, cannot be assumed in advance. There is, at the present time, no adequate evidence for pooling by size on the basis of the records obtainable from the use of the present types of mechanical sizers and counters. Neither is it certain that the use of counters unless definitely related to sizes would provide an accurate measure of the total number of packed boxes of each grade in each lot or of even the relative proportions of the total quantity, as measured by either volume or weight, in each grade.

Determination of Price Differentials between Sizes

The same types of problems arise in connection with the establishment of the price rates to be applied to each size or size-group in setting up the money credits to growers as occur in connection with the price rates to be applied to each grade. The universal practice among associations pooling on the basis of sizes is to base the price rates on the weighted-average prices of each size or size group. This has the effect of reflecting in the returns to growers not only the differences in the prices of the several sizes on the same market on the same day, but also the differences in the level of prices between markets and over a period of time. From the standpoint of paying growers in accordance with the market value of the sizes which they contribute, it appears that the determination of price rates on the basis of a simple average of the price differentials between the several grades on the same markets on corresponding days would be superior to the use of weighted-average prices.

In selling lemons on the auction markets the general practice is to include in each car the run of the sizes packed from the particular lot or lots. Occasionally, however, discount sizes are set back for later shipment. At the time they are eventually shipped, these sizes may bring either more or less relative to the prices of the sizes which were originally shipped, solely by reason of a change in the market level. This same situation applies to lemons sold in private-sale markets.

In addition to a change in the market level over a period of time, some

sizes may bring more or less than other sizes merely by reason of differences in the level of prices on the same day in the particular markets to which they were sent. The largest total amount of money may be secured from a given volume of shipments by selling the smaller sizes in some markets and the larger sizes in other markets, yet the differences between the weighted-average prices of the several sizes might have been materially modified if the distribution of the sizes between the markets had been changed.

In private-sale markets, cars containing a number of different sizes of the same grade are frequently sold at a flat price per box, on the grounds that the entire car brings more total money than it would if each size were priced separately. That each size was worth the same price to the buyers, however, does not necessarily follow. In deciding whether to pay the flat price, he probably estimated, at least roughly, the prices at which he could sell each of the sizes and, knowing the number of boxes of each size in the car, arrived at total amount of money which he felt he could pay for that particular car. If each size had been priced separately, he would have paid more than the flat price for some sizes and less than the flat price for other sizes.

Pooling on the Basis of Size Groups

Only a few associations have separate pools for each size. Most of them pool on the basis of size groups. Although there is considerable difference between associations as to the precise groupings of sizes, the general practice is to combine the large sizes in one group, the small sizes in another group, and to keep the intermediate sizes separate.

The reason generally given by packing-house managers for combining sizes instead of pooling each separately is that it results in a saving in costs without sacrificing substantial equity between the growers.

The question of the extent of differences in returns to individual growers with pooling on the basis of size groups as compared with separate pools for each size has already been discussed. The conclusion reached was that the average differences over a period of years are likely to be negligible, while the differences in any one year are likely to be insignificant except in extreme cases. 20/

Although no cost figures are available, careful observation supports the claim that it is less expensive to pool on the basis of size groups than to pool each size separately. This saving in cost, however, is not great and is confined almost entirely to the calculation of the pool statements of the individual growers. Most of the expense connected with pooling on the basis of sizes must be incurred whether pooling is by each size or by groups of sizes. Pooling by size groups involves the combining of the separate sizes into a smaller number, both with respect to the number of units and the price rates. Thus, as usually done, it is first necessary to determine the number of units of each size of each grower's fruit before the number of units in each size group can be calculated. In determining the price rates to be applied to the size groups, both the number of boxes sold and the money received for each size in the size group have to be added. When three sizes are combined in one size group, the calculation of the price rate involves one division instead of three and one subtraction of the association's

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20/ This conclusion is predicated on the assumption of at least four size groups such as 270's and larger, 300's, 360's, and 432's and smaller; or 240's and larger, 270's and 300's, 360's and 432's, and 490's and smaller.

packing charge instead of three. The saving here is negligible. The chief reduction in expense has to do with the preparation of the individual grower's pool statements. The total number of calculations involved in closing a pool, particularly if there are many growers, runs into the thousands. The doubling of the number of size pools nearly doubles the number of calculations required.

The combining of the separate sizes into size groups avoids none of the serious difficulties involved in pooling each size separately. The problems relating to cleanup, combination lots, and determination of price rates are identical in both cases.

As far as sizes are concerned, the difficulties connected with cleanups and the combination lots could be eliminated by taking out the smallest sizes such as 588's and 540's with a second mechanical sizer at the washer. 21/ Pooling would then be on the basis of two size groups, 490's and larger and 540's and smaller. The extent of the differences in returns between individual growers with this system as compared with separate pools for each size has already been discussed. The use of a mechanical sizer, however, introduces the problem discussed under the section entitled "Mechanical Sizer and Counter." If the sizer is set so as to remove round lemons which would pack 540's, it would also remove a considerable number of oblong lemons which would pack 490's, while if set so that oblong lemons which would pack 490's would not be removed, a considerable proportion of the round lemons which would pack 540's would not be removed. This same type of situation, of course, already exists with respect to lemonettes.

Another problem which would arise under this system relates to the increase in the number of separate lots into which each grower's deliveries would be divided. At least one additional lot would be required and, if the 540's and smaller are sorted by color, as many additional lots would be created as there are color classifications. It appears likely, however, that seldom would more than two color classifications be needed for these small lemons. While many of them are green, they tend to be more similar to tree-ripe lemons than to the larger green lemons, as far as keeping quality is concerned.

Conclusions with Respect to Size Pools

The establishment of separate size pools within each grade pool appears to be the only certain way of assuring that the returns paid the individual growers will, over a period of several years, fully reflect the average differences in the market value of their products occasioned by the differences in the sizes of their fruit. It will also result in each grower receiving for the particular sizes he contributes to each time pool the average net prices realized by the association for those particular sizes.

Pooling, on the basis of size group, involves less accounting expense than pooling each size separately, but lacks the certainty of the latter with respect to each grower's being paid in accordance with the market prices of the particular fruit he contributes to a given time pool. Over a period of years, however, the division of the returns between the individual growers is likely to be substantially the same under both systems.

Under the methods now employed, lemons are sorted by sizes in the process of packing, with the result that the number of units of each size or size group in

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21/ It is now common practice to remove lemonettes at the washer by means of a mechanical sizer.

[illegible] is applicable. [illegible] the total number [illegible] particularly if there are only [illegible] of size [illegible] calculations [illegible]

[illegible] sizes [illegible] each size [illegible] are identical [illegible] cases.

As far as sizes are concerned, the difficulties connected with the [illegible] into grades [illegible] of the smallest sizes [illegible] would [illegible] on the basis of [illegible] of returns [illegible]

[illegible] If the size is not [illegible] number of [illegible] would [illegible] of course, [illegible]

[illegible] in the number of [illegible] are [illegible] a share are [illegible] two [illegible]

Conclusions with respect to this topic.

The establishment of [illegible] grades [illegible] the only [illegible] over a period of [illegible] the sizes of [illegible] fruit [illegible] also [illegible] production of these particular sizes.

Setting, on the basis of [illegible] grade, [illegible] fruit [illegible] the same [illegible]

Under the [illegible] with the result that the number of [illegible] size [illegible]

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a/ It is common [illegible] sizes.

each lot cannot be precisely determined until after the lemons are packed. Associations packing from trays make no attempt, because of the expense involved, to keep each lot separate until it has been packed and consequently do not pool on the basis of size. Associations packing from belts, tubs, or bins are able without undue expense to keep large lots sufficiently separate until after they have been packed and thus provide a very close approximation to the number of units of each size in such lots. In the case of small lots, however, the cost of keeping them separate until after they have been packed is apparently so great that no association does it. Instead they place several lots, each of which contains usually 50 storage boxes and less, in a combination lot and prorate the sizes packed from the combination lot among the several growers. The fruit in such combination lots is not pooled on the basis of size.

There is a reasonable prospect that the combining of all sizes within each grade, except the smallest size, would over the next several years tend to result in about the same division of the total net amount of money among the individual growers as would occur if each size is pooled separately. For any given pooling period, however, the division would most likely be considerably different. It appears to be feasible to remove the smallest sizes, such as 540's and 588's, at the washer by means of a mechanical sizer. This would eliminate the difficulties, so far as sizes are concerned, connected with estimating cleanups and combination lots. The number of lots into which each grower's fruit is sorted, however, would be increased.

The determination of the number of units of each size in each individual lot by means of mechanical sizers and counters or from samples appears to have some possibilities, but would require careful experimentation before their potentialities could be definitely ascertained.

The use of weighted-average prices as a basis for determining the price rates by sizes in setting up the money credits to growers has some disadvantages which could be overcome by the use of a simple average of price differentials between sizes in the same markets on corresponding days. This latter, however, would involve more clerical work.

[illegible] are based on [illegible] until after the [illegible], basis, [illegible] because of the amount involved, [illegible] the bulk of rice. Accumulations [illegible] from lots, [illegible] and three [illegible] large lots sufficiently [illegible] until after they have been pooled and thus provide a very close approximation to the amount of value of [illegible] lots. In the case of small lots, however, the cost of [illegible] would [illegible] so great that [illegible] does [illegible]. Instead [illegible] several lots, [illegible] of which [illegible], in a combination lot and [illegible] pooled from the [illegible] lot among the several [illegible]. The [illegible] in such [illegible] lots is not pooled on the basis of size.

There is a reasonable argument that the crediting of all [illegible]

The [illegible] individual [illegible]

The use of [illegible]

TIME POOLS

The type of time pool employed by the Santa Paula Citrus Fruit Association during the past ten years is the annual shipping pool. Every grower has been paid the same price per pound for all lemons of the same grade shipped during the twelve months November through October, irrespective of the time they were shipped. Any lemons in the packing-house at the end of the crop year were carried over into the following crop year for the accounts of the individual growers. A number of th the other lemon cooperative packing associations also employ an annual shipping pool. The large majority, however, employs multiple time pools based either on shipments or on picks. Those based on picks are the most numerous.

Division of Annual Returns between Growers:
Multiple Time Pools vs. Annual Pool

The possibility of obtaining additional returns over a period of years from marketing lemons during one part of the season rather than during another part depends upon (1) the existence of price changes which tend to be repeated year after year at about the same part of the season, or (2) the existence of changes in the volume of consumption which tend to be repeated year after year at about the same part of the season. However, from the standpoint of the returns paid the individual growers over a period of several years closely reflecting the average differences in the market value of their fruit, the existence of definite seasonal variation in prices or consumption is of significance only if there also exists distinct variations in the time of the season during which the lemons of individual growers can be shipped. Likewise, the existence of distinct variations between individual growers in the time of the season during which their lemons can be shipped is of significance only when there is also present definite seasonal variations in prices or in consumption.

Variation in Time when Fruit of Individual Growers Can Be Shipped.-- Records of the monthly shipments and deliveries of 56 growers who had delivered lemons to the Santa Paula Citrus Fruit Association from the same orchards for the ten-year period 1925-26 to 1934-35 were obtained. As shown later, the crop year November through October is, from the standpoint of both prices and consumption of lemons, about evenly divided into two six-month periods; namely the winter months, November through April, and the summer months, May through October.

Table 25 shows the average percentages of the annual shipments of the 56 growers that were shipped during the winter months. It will be noted that there has been substantial variation as between these growers. On the average for the ten-year period, a much smaller percentage of the annual shipments of some growers was made in the winter months than of other growers. Table 26 shows the consistency with which the percentage of the annual shipments of the individual growers during the winter months has been under or over the Association average. Thirteen of the growers were under the Association average in each of the ten years, while 2 of the growers were over the Association average in each of the ten years.

The variation between growers in the average percentages of annual shipments in the winter months is associated in part with the locations of the orchards, as shown in table 27. The area served by the Santa Paula Citrus Fruit Association was divided into three parts: west of Santa Paula, east of Santa Paula, and the canyon which lies north of Santa Paula. In general, growers having the largest percentage of their annual shipments in the winter months are located east of Santa Paula, while growers having the smallest percentage of their annual shipments in the winter months are located west of Santa Paula and in the canyon. There are, however, some important exceptions.

[illegible]

Division of Annual Returns [illegible]

[illegible] vs. [illegible]

The possibility of obtaining additional returns [illegible]

[illegible]

[illegible] shows the [illegible] percentage of the annual [illegible]

The variation between groups in the average percentages of annual [illegible]

[illegible]

TABLE 25

Lemons: Santa Paula Citrus Fruit Association; Frequency Distribution of Percentage of Annual Shipments of 56 Growers During November through April, Average 1925-26 to 1934-35

Class interval in per cent of annual shipments	Number of growers	Per cent of growers
8.2 to 16.0	17	30.4
16.1 to 26.0	26	46.4
26.1 to 36.0	7	12.5
36.1 to 46.0	5	8.9
46.1 to 49.4	1	1.8
Total	56	100.0

TABLE 26

Lemons: Santa Paula Citrus Fruit Association; Comparison of the Percentages of Annual Shipments During November through April of 56 Growers with the Average of the Association, 1925-26 to 1934-35

Number of years under association average	Number of growers	Per cent of growers
10	13	23.3
9	13	23.3
8	6	10.7
7	7	12.5
6	3	5.3
5	2	3.6
4	3	5.3
3	3	5.3
2	1	1.8
1	3	5.3
0	2	3.6
Total	56	100.0

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]	[illegible]	[illegible]

TABLE 27

Lemons: Santa Paula Citrus Fruit Association; Frequency Distribution of Percentage of Annual Shipments of 56 Growers During November through April, by Districts, Average 1925-26 to 1934-35

Class interval in per cent of annual shipments	Number of growers			
	West	Canyon	East	Total
8.2 to 16.0	9	6	2	17
16.1 to 26.0	18	4	4	26
26.1 to 36.0	1	1	5	7
36.1 to 46.0	0	0	5	5
46.1 to 49.4	0	0	1	1
Total	28	11	17	56

TABLE 28

Lemons: Santa Paula Citrus Fruit Association; Frequency Distribution of Percentage of Annual Deliveries of 56 Growers During November through February, Average 1925-26 to 1934-35

Class interval in per cent of annual deliveries	Number of growers	Per cent of growers
6.4 to 14.1	9	16.1
14.2 to 24.1	33	58.9
24.2 to 34.1	12	21.4
34.2 to 41.8	2	3.6
Total	56	100.0

Much the same situation which has prevailed with respect to variations between growers in the percentage of annual shipments in the winter months has also existed with respect to variations in the percentage of deliveries to the packing-house, as shown in tables 28 and 29.

That there would be a close relation between the percentage of deliveries and the percentage of shipments is a natural expectation, since within each color classification the order of shipments is based upon the order of deliveries. The failure of these two series to show virtually perfect correlation is accounted for chiefly by the differences between growers in the proportions of their lemons in the several color classifications, and to some extent by the positions of the growers in the picking schedule.

The data presented in tables 25 to 29 merely show the extent of the variation between individual growers in the time of picking and shipping under the conditions which existed during the ten years 1925-26 to 1934-35. One of these conditions was an annual pool. It does not necessarily follow that the same differences between the growers with respect to the time of picking and shipping would have occurred under multiple time pools.

Under an annual pool it is a matter of indifference to the individual grower when his particular fruit is shipped, since he receives the same price per unit if his fruit is shipped at one time as he does if it is shipped at another time.[22] With respect to picking, the grower's chief concern is to have his fruit picked at the time the largest quantity of the most desirable grades and sizes can be obtained without seriously inconveniencing his farm operations. Under multiple time pools, however, each grower's total returns for the season may be either much larger or much smaller by having the bulk of his fruit in one rather than in another of the time pools. As shown later, prices of lemons during the summer months have, during the past ten years, averaged considerably above the prices in the winter months. It seems reasonable to expect, therefore, that to the extent that they could have done so, growers whose lemons were picked early would have tended to delay their deliveries, in order to have a larger proportion of their fruit in later pools. [23] In the Santa Paula Citrus Fruit Association, because of differences in topography and character of soil, some orchards can be picked sooner after a rain than can other orchards. As a matter of convenience to the Association, owners of such orchards have permitted the lemons thereon to be picked out of turn. This has enabled the Association to secure more effective utilization of its labor and equipment, and to provide a more continuous supply of lemons to its customers.

From the above discussion the inherent differences between orchards with respect to the time of picking apparently are not as great as the differences shown in tables 28 and 29. Nevertheless, there are substantial inherent differences between orchards. While the use of the annual pool has tended to accentuate the variation between growers in the time of picking, the available evidence indicates that there would be significant variation under multiple time pools.

From the standpoint of returns to growers the time of picking is important only as it affects the time of shipment. Whether or not one grower can have a

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[22] This assumes that all fruit is graded before there is significant loss from deterioration in quality and shrinkage.

[23] It should of course be recognized that, on the assumption that the same conditions exist with respect to prices, quality of fruit, and convenience of farm operations, it is generally to the interest of the individual grower to have his fruit picked early rather than late in order to avoid the risk of frost and wind damage.

Much the same situation which has prevailed with respect to variations between growers in the percentage of annual shipments in the winter months has also existed with respect to variations in the percentage of deliveries to the packinghouse, as shown in tables 26 and 27.

That there would be a close relation between the percentage of deliveries and the percentage of shipments is a natural expectation, since, within each color classification the order of shipments is based upon the order of deliveries. The failure of these two series to show virtually perfect correlation is accounted for chiefly by the differences between growers in the proportions of their lemons in the several color classifications, and to some extent by the positions of the growers in the picking schedule.

The data presented in tables 25 to 29 merely show the extent of the variation between individual growers in the time of picking and shipping under the conditions which existed during the ten years 1925-26 to 1934-35. One of these conditions was an annual pool. It does not necessarily follow that the same differences between the growers with respect to the time of picking and shipping would have occurred under multiple time pools.

Under an annual pool it is a matter of indifference to the individual grower when his particular fruit is shipped, since he receives the same price per unit if his fruit is shipped at one time as he does if it is shipped at another. With respect to picking, the grower's chief concern is to have his fruit taken at the time the largest quantity of the most desirable grades and sizes can be obtained without seriously inconveniencing his farm operations. Under multiple time pools, however, each grower's total returns for the season may be either much larger or much smaller by having the bulk of his fruit in one rather than in another of the time pools. As shown later, prices of lemons during the summer months have, during the past ten years, averaged considerably above the prices in the winter months. It seems reasonable to expect, therefore, that to the extent that they could have done so, growers whose lemons were picked early would have tended to delay their deliveries, in order to have a larger proportion of their fruit in later pools. 13/ In the Santa Paula citrus fruit association, because of differences in topography and character of soil, some orchards can be picked sooner after a rain than can other orchards. As a matter of convenience to the Association, owners of such orchards have permitted the lemons from them to be picked out of turn. This has enabled the association to secure more effective utilization of its labor and equipment, and to provide a more continuous supply of lemons to its packinghouse.

That the other differences [illegible] growers with respect to the time of picking apparently are not as great as the differences shown in tables 28 and 29. Nevertheless, there are substantial differences between orchards. While the use of the annual pool has tended to reduce the variation between growers in the time of picking, the available evidence indicates that there would be significant variation under multiple time pools.

From the standpoint of returns to growers the time of picking is important only as it affects the time of shipment. Whether or not the grower ...

13/ This assumes that all fruit is picked before there is significant loss from deterioration in quality and shrinkage.

14/ It should of course be recognized that, on the assumption that the same conditions exist with respect to volume, quality of fruit, and economy of farm operations, it is generally to the interest of the individual grower to have his fruit picked early rather than late in order to avoid the risk of frost and wind damage.

TABLE 29

Lemons: Santa Paula Citrus Fruit Association; Frequency Distribution of Percentage of Annual Deliveries of 56 Growers During November through February, by Districts, Average 1925-26 to 1934-35

Class interval in per cent of annual deliveries	Number of growers			
	West	Canyon	East	Total
6.4 to 14.1	5	2	2	9
14.2 to 24.1	21	8	4	33
24.2 to 34.1	2	1	9	12
34.2 to 41.8	0	0	7	2
Total	28	11	17	56

TABLE 30

Lemons: Indexes of Seasonal Variation in F.O.B. Prices Received by the California Fruit Growers Exchange and by the Santa Paula Citrus Fruit Association

Month	C.F.G.E. 1913-14 to 1934-35	1925-26 to 1934-35		1930-31 to 1934-35	
		C.F.G.E.	S.P.C.F.A.	C.F.G.E.	S.P.C.F.A.
	per cent	per cent	per cent	per cent	per cent
November	93	97	96	89	90
December	87	97	95	96	94
January	87	83	83	81	81
February	84	80	81	79	79
March	80	80	82	77	78
April	85	81	85	77	78
May	104	99	103	99	99
June	109	103	105	109	110
July	119	122	124	123	126
August	116	116	118	119	121
September	121	127	123	133	132
October	115	115	105	118	112

larger proportion of his crop on the summer market than can another grower depends not only upon the time the fruit is picked but also upon the length of time it can be kept in storage without undue loss. 24/ The crux of the situation lies in the extent of the differences between orchards with respect to the time of the year the fruit from such orchards can be shipped.

Seasonal Variation in Prices of Lemons.-- Although lemon prices are characterized by wide fluctuations from month to month, they have nevertheless exhibited over a period of years a definite seasonal variation. An index of seasonal variation in the f.o.b. prices received for lemons shipped by the California Fruit Growers Exchange from 1913-14 to 1934-35 is shown in table 30. During this twenty-two year period there was a definite tendency for prices to be low in the winter months as compared with the summer months. In each of the months, November through April, the index was below 100 (that is, the average price for the year); in each of the months, May through October, the index was above 100. Table 31 shows the number of years during the twenty-two year period 1913-14 to 1934-35 that the prices in each month were below or above the average for the crop year. Thus prices in November were below the average of the crop year in fourteen of the twenty-two years and were above the average of the crop year in eight of the twenty-two years. On the other hand, the situation with respect to September was just reversed. The general situation shown by table 31 is that in most of the past twenty-two years prices in the winter months were relatively low, while prices in the summer months were relatively high.

A comparison of the index of seasonal variation in prices received for lemons shipped by the Santa Paula Citrus Fruit Association with the index of seasonal variation in prices received by the California Fruit Growers Exchange for the ten years 1925-26 to 1934-35 and for the five years 1930-31 to 1934-35 is shown in table 30. It will be noted that the two indexes are very similar. This is accounted for by the fact that the conditions which have caused the prices of lemons to be relatively high in the summer months and relatively low in the winter months were industry-wide and not confined to the Santa Paula Citrus Fruit Association. There is no evidence which indicates that the seasonal variation in prices received by this Association was affected by the particular pooling system which it had. On the other hand, it appears certain that about the same seasonal variation in prices would have prevailed under any other type of pooling system. The level of prices may have been different under another type of pooling system, but the relative changes in prices during the season would have remained approximately the same.

Although over a long period of years prices of summer lemons have averaged substantially above the prices of winter lemons, certain factors are at work which will tend to narrow this price differential during the coming years, but apparently it will not be entirely eliminated (see table 32). The factors tending to narrow the price differential are (1) the increase in the shipments of summer lemons in relation to the shipments of winter lemons, and (2) the decrease in summer temperatures in consuming markets from the high level of recent years. The conditions which will tend to prevent the average differential between the prices of summer and winter lemons from being entirely eliminated are (1) the costs and risks involved in carrying lemons available for shipment in the winter months into the summer months, (2) the possibility of carrying summer lemons into the following winter, and (3) the probability of occasional high summer temperatures.

24/ This is discussed later under the section entitled "Pooling on the Basis of Color Classifications."

TABLE 31

Lemons: Number of Years from 1913-14 to 1934-35 that Monthly Index of F.O.B. Prices Received by California Fruit Growers Exchange Was below or above the Average for the Year

Month	Number of years	
	Under 100	100 and over
November	14	8
December	17	5
January	19	3
February	19	3
March	19	3
April	18	4
May	9	13
June	11	11
July	6	16
August	6	16
September	8	14
October	11	11

TABLE 32

Percentages that California F.O.B. Prices and Shipments in May-October Were of Previous November-April Prices and Shipments Respectively, and June-September Temperature Departures from Normal in Fourteen Eastern Markets

Five-year averages	Per cent May-October of November-April		Temperature departures
	Prices	Shipments	
	per cent	per cent	degrees F
1915-16 to 1919-20	138	137	+0.2
1920-21 to 1924-25	149	161	+1.1
1925-26 to 1929-30	127	178	-0.1
1930-31 to 1934-35	143	178	+2.2

Over the next few years it appears likely that the shipments of lemons in the summer months will increase in relation to the shipments in the winter months, and that this increase in shipments will tend to reduce the price differential between summer and winter lemons. The two conditions tending to cause the relative increase in shipments of summer lemons are (1) the increase in storage facilities under refrigeration, and (2) the increase in the acreage of lemons in late-maturing districts.

Many local lemon packing associations throughout the lemon-producing sections of the state have, in recent years, not only expanded their storage space but of even more significance, have provided cooling facilities of one sort or another. Two incentives have been chiefly responsible for this situation: (1) the relatively high prices of lemons in the summer months, and (2) the proration of shipments under the Exchange Lemon Agreement on the basis of volume of lemons in storage.

The second factor tending to increase the shipments of summer lemons in relation to the shipments of winter lemons is the heavy plantings in the coastal sections, particularly in Ventura and Santa Barbara counties. The bulk of the lemon plantings in recent years has been made in these two counties. All of the acreage in Santa Barbara County and most of the new plantings in Ventura County are located near the coast. In this section the production of summer fruit is much heavier than the average for the state.

In addition to the relative increase in the shipments of summer lemons in prospect as a result of the expansion of storage facilities under refrigeration and of the increase in acreage of later maturing lemons, the probability of lower average summer temperatures in the consuming markets points toward a narrowing of the price differential between summer and winter lemons. During the five years 1931 to 1935 temperature departures in the fourteen principal lemon markets of the United States during the four months of June through September averaged 2.2° Fahrenheit above normal. There are no grounds for expecting these abnormally high summer temperatures to continue indefinitely. From 1908 to 1935 summer-temperature departures averaged 0.7° Fahrenheit above normal. Over this period summer temperatures have exhibited a cyclical tendency. The average departures from normal during the past twenty years by five-year periods are shown in table 32.

The available evidence indicates that, with summer-temperature departures from normal equal to the average of the past twenty-eight years, shipment of lemons during the six months May through October twice as large as shipments during the six months November through April would tend to keep average prices of lemons during each of the six-month periods closely in line. The analysis upon which this conclusion is based will be presented in the final report.

With the expansion of refrigerated storage and the increase in production of summer lemons, it may be physically possible to ship sufficient lemons during the summer months in years of average summer temperatures or below to keep the price of summer lemons closely in line with the price of winter lemons. It does not necessarily follow, however, that over a period of years the price of lemons shipped during the summer months will average as low as the price of those shipped during the winter months. Over a period of years the price during the summer months would need to be sufficiently higher than the price during the winter months to compensate for the cost and risk involved in carrying the lemons. The storing of lemons involves two types of risks: physical deterioration and price declines. Of the two, the risk of price declines is likely to be the most important.

The price of lemons during the summer months is influenced to so great an extent by temperatures in the consuming markets, which cannot themselves be forecast, that it is always uncertain whether or not a large supply of lemons can

Over the next few years it seems likely, that the situation in lemons in the summer months will improve in relation to the situation in the winter months, and that this increase in shipments will tend to reduce the price differential between summer and winter lemons. The two outstanding factors in [illegible] increase in [illegible] of summer lemons are (1) the increase in storage facilities [illegible], and (2) the increase in the acreage of lemons in [illegible] districts.

Many local lemon packing associations throughout the lemon-producing [illegible] of the state have, in recent years, not only improved their storage space but [illegible], have provided cooling [illegible] of the most modern type. [illegible] have been chiefly responsible for this increase: (1) the [illegible] price [illegible] in the summer months, and (2) the [illegible] under the [illegible] on the basis of [illegible].

The second factor tending to increase the shipments of summer lemons is the [illegible] of summer lemons in the [illegible] in the coastal sections, particularly in Ventura and Santa Barbara counties. The bulk of the lemon plantings in recent years has been made in these two counties. [illegible] in Santa Barbara county and most of the new plantings in Ventura county are [illegible]. [illegible] the production of summer fruit is much higher, [illegible] the [illegible] for this crop.

[illegible] prospect of a [illegible] of the expansion of [illegible] an increase of summer-maturing lemons, [illegible] the relationship between summer and winter lemons [illegible] until the last few years [illegible] than [illegible] the next twenty years [illegible].

The [illegible] indicates that, with [illegible] for the next twenty-eight years, [illegible] during the [illegible] the price [illegible]. This conclusion [illegible] will be presented in the third chapter.

With the expansion of [illegible] storage and the [illegible] summer lemons, it may be reasonably expected [illegible] the summer months [illegible] of summer lemons [illegible] value of summer lemons [illegible] in line with the value of winter lemons. It does not necessarily follow, however, that over a period of years the price of lemons during the summer months will average [illegible] as the price during the winter months. Over a period of years the [illegible] price would [illegible] higher than the price during the winter [illegible] the type of [illegible] price [illegible] 1919 [illegible].

The price of lemons during the summer months is [illegible] the [illegible] prices in the [illegible].

be moved into consumption at a reasonable level of prices to growers. There is no certainty at all that with a heavy supply of lemons available for shipment during the summer months the price in any particular summer will be above the price of the preceding winter, and there is always the possibility that it will be lower, unless of course, the price during the winter in question was at a very low level.

From the analysis presented in this section two conclusions appear justified: (1) that the differential between the prices of summer and winter lemons will be materially reduced during the coming years, and (2) that the prices of summer lemons during the next several years will average somewhat above the prices of winter lemons.

Differences in Returns to Individual Growers with Multiple Time Pools as Compared with an Annual Pool.-- Based on the assumption that the total net returns of the Association would have been the same with multiple time pools as with an annual pool, table 33 is designed to show the differences in returns to the 56 growers over the ten-year period 1925-26 to 1934-35 which would have occurred, if instead of an annual shipping pool, the Association had employed two six-months shipping pools. [25] It will be noted that a considerable proportion of the growers would have received substantially more or less than they actually were paid. Under the conditions which have existed, the differences in returns to individual growers with two six-month shipping pools as compared with an annual pool were greater than either (1) the differences in returns with separate pools for each grade as compared with no grade pools (table 6), or (2) the differences in returns with separate pools for each size as compared with no size pools (table 24).

On the other hand, the differences in returns to the 56 growers over the ten-year period with monthly shipping pools as compared with two six-month shipping pools are relatively small, as shown in table 34. Almost 90 per cent of the growers would have received within 5 cents a packed box of the same price under either system.

Seasonal Variation in Shipments.-- An index of seasonal variation in the total shipments of California lemons for the ten years 1925-26 to 1934-35 is shown in table 35. On the average, shipments have been relatively light in each of the months from September through February, with only minor differences between these months. Beginning in March, the volume of shipments has usually increased, with the peak in June. There has usually been a moderate decrease in July, a sharp drop in August, and a further marked decline in September. A comparison of the index of seasonal variation in shipments with the index of seasonal variation in prices (table 30) shows that in general both prices and shipments have been relatively lower in the winter months than in the summer months.

The seasonal index of total lemon shipments from the state roughly corresponds to the index of lemon consumption in this country, if an allowance is made for a lag of about three weeks. It is evident, therefore, that the period of heaviest consumer demand is in the summer months and the period of lightest consumer demand in the winter months.

On the average, shipments of lemons from the Santa Paula Citrus Fruit Association have been relatively lighter in the winter months and relatively heavier

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[25] It is also assumed that the time of shipments of each of the growers' fruit would have remained unchanged.

[illegible] supply [illegible]

[illegible]

[illegible]

On the other hand, the difference in [illegible]

[illegible]

[illegible]

[illegible]

1/ It is [illegible]

TABLE 33

Lemons: Santa Paula Citrus Fruit Association; Frequency Distribution of Differences in Returns per Packed Box to 56 Growers with Two Six-Months Shipping Pools as Compared with an Annual Shipping Pool Average 1925-26 to 1934-35

Class interval in cents per box	Number of growers	Per cent of growers
0 to 5	13	23.2
6 to 10	16	28.6
11 to 15	19	33.9
16 to 20	6	10.7
21 and over	2	3.6
Total	56	100.0

TABLE 34

Lemons: Santa Paula Citrus Fruit Association; Frequency Distribution of Differences in Returns per Packed Box to 56 Growers with Monthly Shipping Pools as Compared with Two Six-Months Shipping Pools Average 1925-26 to 1934-35

Class interval in cents per box	Number of growers	Per cent of growers
0 to 5	50	89.3
6 to 10	5	8.9
11 to 15	1	1.8
Total	56	100.0

TABLE 35

Lemons: California; Index of Seasonal Variation in Total Shipments, 1925-26 to 1934-35

Month	Per cent	Cumulative per cent
November	4.08	4.08
December	5.12	9.20
January	5.84	15.04
February	4.92	19.96
March	7.50	27.46
April	8.73	36.19
May	14.09	50.28
June	16.31	66.59
July	14.08	80.67
August	9.08	89.75
September	4.95	94.70
October	5.30	100.0

TABLE 36

Lemons: Santa Paula Citrus Fruit Association; Indexes of Seasonal Variation in Shipments and in Deliveries to the Packing Plant, 1925-26 to 1934-35

Month	Shipments		Deliveries	
	Per cent	Cumulative per cent	Per cent	Cumulative per cent
November	2.00	2.00	2.55	2.55
December	2.15	4.15	4.46	7.01
January	3.60	7.75	7.70	14.71
February	3.49	11.24	9.49	24.20
March	6.57	17.81	15.43	39.63
April	8.35	26.16	14.82	54.45
May	14.85	41.01	16.60	71.05
June	18.25	59.26	11.42	82.47
July	18.11	77.37	5.66	88.13
August	11.48	88.85	3.97	92.10
September	5.17	94.02	3.74	95.84
October	5.98	100.00	4.16	100.00

in the summer months than from the state as a whole. During the ten years 1925-26 to 1934-35 an average of only 26 per cent of the annual shipments of this Association was made during the six months November through April as compared with 36 per cent for the entire state.

Table 36 shows a comparison between the index of seasonal variation in shipments and the index of seasonal variation in deliveries of the Santa Paula Citrus Fruit Association for the period 1925-26 to 1934-35. On the average, deliveries have been relatively heavier than shipments during the winter months, while shipments have been relatively heavier than deliveries during the summer months.

During the past ten years there has frequently been a surplus of lemons in the winter months, but seldom a surplus in the summer months. Table 37 shows the percentages of the total deliveries of lemons of the Santa Paula Citrus Fruit Association sent to the products plant during each of the past ten years. In only three of the ten years was the percentage less than 10 per cent while in four of the ten years it was over 15 per cent. Judging from the seasonal movement of deliveries and shipments shown in table 36, it appears that virtually all the merchantable fruit sent to the products plant was picked in the winter months, and that practically no merchantable fruit picked in the summer months was used for by-products.

This situation suggests that, where the loss on merchantable fruit sent to the products plant is borne by the Association rather than by the individual growers of the particular fruit so sent, two time pools during the crop year are needed. As a general proposition the burden of surplus production should fall on those who produced it and not upon those who did not contribute to it. Even though the selling prices of lemons during the coming years should average the same in the summer months as in the winter months, growers having the bulk of their fruit shipped in the summer months will, in years of excessive production, be able to market a much larger proportion of their crops than will growers with fruit which must be marketed mostly in the winter months. From a market standpoint some growers have lemons available for sale at the time of the year when consumers desire them keenly, while other growers have lemons available for sale at the time of the year when consumers' demand is much more limited. One of the characteristics of lemons which the market has determined to be important is the time of the year they are available for consumption.

In associations where merchantable fruit sent to the products plant is for the account of the individual growers of that particular fruit, and this is the customary practice, the length of the pooling period has little effect upon the relative proportions of the crops shipped as between growers of early and late fruit. As long as this practice is continued, there is no need for multiple time pools from the standpoint of seasonal variation in shipment alone. The problems which arise under this practice were discussed in connection with grade pools.

Transition from One Pooling Period to Another with Multiple Time Pools

One of the most serious problems which arises when multiple time pools are employed relates to the transition from one pooling period to the next. This problem is present even with an annual pool, but the amount of fruit involved in the transition is usually such a small proportion of the total in the pool that it causes no particular difficulty. As the number of separate pooling periods during the season is increased, however, the difficulty is accentuated, since the amount of fruit involved in the transition in relation to the amount of fruit in a specific time pool is increased. The annual pool is ended at a time of the year when there is usually little fruit in the packing-house, but some of the multiple time pools are ended at times when there is a large amount of fruit in the packing-house.

in the summer months than from the [illegible] as a whole. During the five-year period 1926-30 an average of only 20 per cent of the annual [illegible] was made during the [illegible] months November through April [illegible] per cent [illegible].

Table 38 shows a comparison between the index of seasonal variation in [illegible] and the index of seasonal variation in [illegible] for the period 1926-30 to [illegible]. [illegible] have been relatively [illegible] during the winter months, [illegible].

During the past ten years there has been [illegible] in the [illegible] months. [illegible] during most of the past ten years. The only [illegible] was [illegible] than 10 per cent [illegible]. [illegible] Table 38, [illegible] that [illegible] all the [illegible] and that [illegible] in the summer months [illegible].

This [illegible] suggests that, when the loss on [illegible] the producing [illegible] is borne by the association rather than by the individual [illegible] of the [illegible], two [illegible]. [illegible] the winter months [illegible]. [illegible] for consumption.

[illegible]

[illegible]

Another with multiple [illegible]

[illegible]

TABLE 37

Lemons: Santa Paula Citrus Fruit Association; Percentages of Annual Deliveries Sent to the Products Plant, 1925-26 to 1934-35

Year November-October	Per cent
1925-26	11.60
1926-27	19.40
1927-28	8.60
1928-29	11.70
1929-30	4.70
1930-31	15.80
1931-32	17.30
1932-33	12.86
1933-34	7.58
1934-35	26.64

TABLE 38

Lemons: Santa Paula Citrus Fruit Association; Frequency Distribution of Proportions of Total Deliveries of 56 Growers from November through April that Were Green
Average 1931-32 to 1934-35

Class interval in per cent	Number of growers	Per cent of growers
20.0 to 29.9	2	3.6
30.0 to 39.9	20	35.7
40.0 to 49.9	20	35.7
50.0 to 59.9	11	19.6
60.0 to 69.9	2	3.6
70.0 to 79.9	1	1.8
Total	56	100.0

Multiple Time Pools Based upon Shipments.-- A few lemon associations employ multiple time pools based upon shipments. The most usual lengths of the pooling periods are either one month, three months, or four months. Although shipping pools have several advantages, they have one serious disadvantage which accounts for their limited use. This has to do with the determination of whose fruit is to be included and whose fruit is to be excluded from a given time pool.

During most of the season there is more fruit in the house available for shipment than can be shipped within a specified short period of time. Some of the fruit must be shipped but all of it cannot be shipped. Consequently, the manager must choose from the available supply the particular fruit to be shipped, and the choosing of that fruit automatically precludes the shipment of other fruit in that time pool. The manager's choice, whatever it may be, is likely to affect some growers advantageously and other growers disadvantageously, since the returns per unit from two adjoining shipping pools are seldom the same. In selecting from the available supply the particular lots to be shipped next, the manager must decide both between lots within the same color classification and between lots in different color classifications. The general practice is to base the order of shipments within each color classification upon the time of arrival at the packinghouse, and to base the order of shipments between color classifications upon the condition of the fruit with respect to the length of time it can be kept in storage without undue loss from deterioration in grade and shrinkage.

Even if all growers' lemons were comparable with respect to rate of maturity and keeping quality, the employment of multiple time pools based upon shipments would subject the individual grower to the risk of having a larger-than-average percentage of his fruit in a low-priced pool. For purposes of illustration, assume that each grower's fruit consists of dark-green lemons, and that each lot is shipped in the order in which it was received. Assume further that Grower A's delivery was made in the morning and Grower B's delivery was made in the afternoon of the same day, and that subsequently Grower A's fruit was packed in the afternoon and Grower B's fruit the following morning. Now if it happened that the end of one shipping pool and the beginning of another occurred at that particular time, Grower A's delivery would be in the first pool and Grower B's would be in the second. To the extent that the returns per unit from the two pools were different, one of the growers would lose while the other would gain merely by reason of their respective positions in the picking schedule. If their positions in the picking schedule had been reversed, their returns per unit would have been reversed. With multiple shipping pools this type of situation occurs frequently, and the larger the number of separate pooling periods during the season the more often will it happen.

With differences between growers in the proportions of their respective deliveries in the several color classifications, there is the further risk with multiple shipping pools, arising from the choice of the particular color classification to be shipped during the latter part of one pool and the first part of another. For example, suppose that both silver and light-green lemons can be shipped either during the last week in pool No. 1 or during the first week in pool No. 2. The light-green lemons, however, can be kept in storage longer than the silver, so it is decided to ship the latter in the first pool, and the former in the second pool. It so happens, however, that the returns per unit in the first pool were considerably above those in the second. The grower who had a large proportion of light-green lemons may well ask why they were not shipped instead of the silver lemons, since the latter could have been held in storage without deterioration in grade until the start of the second pool. On the other hand, if it happens that the returns per unit were higher in the second pool than in the first, the grower who had a large proportion of silver lemons may ask why they were not held until the start of the second pool.

Multiple Time Pools in Lemon Marketing.— A few lemon associations employ multiple time pools based upon [illegible]. The most usual lengths of the pooling periods are either one month, three months, or four months. [illegible] these several arrangements, [illegible] in limited use. This has to do with the determination of which fruit [illegible] for inclusion and those fruit as to be excluded from a given time pool.

Under most of the season pools in use, fruit is [illegible] which can be shipped within a specified short period of time. [illegible] must be shipped but all of it cannot be shipped. Consequently, the packer must choose from the available supply the particular fruit to be shipped, and [illegible] of that fruit out generally precludes the [illegible] of other fruit in [illegible]. The manager's choice, whatever it may be, is likely to affect some growers advantageously and other growers disadvantageously, [illegible]. In selecting from the available supply the particular lots to be shipped next, the manager must [illegible] both between lots within the same color classification and between lots in different color classifications. The general practice is to base the order of shipments within each color classification upon the time of arrival at the packing-house, and to base the order of shipments between color classifications upon the [illegible] of the fruit with respect to the length of time it can be kept in storage without undue loss from deterioration in grade and shrinkage.

[illegible] all growers' lemons were comparable with respect to [illegible], the employment of multiple time pools based upon [illegible] the individual grower to the risk of having a [illegible] percentage of his fruit in a low-valued pool. For purposes of illustration, suppose that each grower's fruit [illegible] of dark-green lemons, [illegible]

With differences in [illegible] growers in the proportions of their deliveries in the several color classifications, [illegible] to be shipped during the latter part of one pool and the first part of another. For example, suppose that both silver and light-green lemons can be [illegible] during the last month in pool No. 1 and [illegible] pool No. 2. The light-green lemons, however, can be kept in storage longer than the silvers, so it is desired to ship the silvers in [illegible] and the [illegible] in the second pool. [illegible] until the close of the second pool.

The foregoing problems arise only in connection with fruit that is available for shipment in either of two shipping pools. They do not arise in connection with fruit which is not sufficiently cured to be shipped within a given pool or with fruit which cannot be held until the next pool. The time during which these problems are most acute is at the beginning and end of the pooling periods.

One association, in the attempt to eliminate the extreme differences in returns per unit between growers who deliver fruit of the same color classifications within a short space of time, adjusts the shipments of the individual growers so as, in effect, to place a portion of the shipments made during the latter part of one pool into the following pool and a portion of shipments made during the first part of a pool into the previous pool. A sliding-scale arrangement is used which provides a gradual rather than an abrupt change from one pool to another. The adjustments are made within each color classification, but not between color classifications. 26/

Multiple Time Pools Based upon Picks.-- Because of the difficulties which arise in connection with shipping pools, most associations which employ multiple time pools base such pools upon picks rather than upon shipments. The most common is known as the "pick-around pools." Under this system the orchards of the growers are picked in rotation, each orchard being picked usually from eight to ten times a year. Starting at the beginning of the crop year all the fruit picked from each orchard on the first pick-around is placed in pool No. 1; all of the fruit picked on the second pick-around in pool No. 2; and so on through the season. Thus, there are as many separate time pools as there are pick-arounds. The grade-out, shipments, and sales returns of the fruit in each pool are kept separate, and the payments to growers are based upon the average prices received for comparable grades and sizes of all the fruit in the pool, irrespective of the time any particular lot was shipped. 27/

Some associations, instead of having separate pools for each pick-around, combine two or more pick-arounds in one pool which thus extends the length of each pooling period and reduces the number of time pools during the season. One association has only two time pools. All fruit picked during the six months, November through April, is placed in the first pool and all fruit picked during the six months, May through October, in the last pool. The management attempts to pick each orchard at the time the fruit thereon is in prime condition without particular reference to a picking rotation among the growers.

If, on each pick-around, all orchards in an association were picked on the same day or even in the same week, the problems of transition from one pooling period to the next would disappear. But such a procedure would be extremely expensive. In order to secure reasonable operating costs it is necessary to have a fairly uniform flow of fruit from the orchards to the packing-house. This requires fairly continuous picking.

Assume for the time being that all orchards in an association are picked on each pick-around and that a definite picking schedule can be followed without undue delay; there may nevertheless be substantial differences in the annual returns per unit between growers having comparable fruit in all respects. One

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26/ This type of adjustment is complex. It will be presented in detail in the final report.

27/ Some associations also pool on the basis of color classifications. This is discussed later.

grower may have a much larger proportion of his total crop in a given pick-around pool than another grower merely by reason of his position in the picking schedule. The most extreme case of differences between growers in the proportions of their total crops in a given pick-around pool, by reason of their respective positions in the picking schedule, arises at the time of the year when the picks are the heaviest and between those growers whose fruit is picked at the beginning of the picking schedule and those whose fruit is picked at the end. Suppose, for example, that the fourth pick is made between March 15 and April 30, inclusive; that Grower A's orchard is picked on March 15 and that Grower B's orchard is picked on April 30; and that the period of heaviest production on both orchards occurs during this interval of time. Under this situation Grower B would have his heaviest pick of the year in pool No. 4 while Grower A's heaviest pick would be in pool No. 5, although the period of heaviest production on both orchards coincided. To the extent that the returns per unit in the two pools were different, and this is usually the case, one of the growers would lose and the other would gain, not because of inherent differences in their fruit but because of chance.

There is no certainty that gains and losses from this source will average out over a period of several years. In sections in which lemons mature the year around, it is no easy matter to change radically the picking schedule from one year to another. Only moderate changes can be made without danger of loss from deterioration of the fruit in the orchard. With only moderate changes in the picking schedule made each year, it might require from ten to fifteen years to effect a complete shift in the order of pickings.

Risks of the sort described above cannot be entirely eliminated with multiple time pools, but they can be materially reduced by two methods: (1) extending the length of the pooling periods, and (2) picking the orchards in the order of the relative rates of maturity of the fruit.

When time pools are based upon picks, extension of the pooling period requires the inclusion of one or more additional pick-arounds in the pool. The fewer the number of time pools in a year, the fewer are the number of transitions between pools and the smaller is the proportion of the fruit involved in the transitions.

To the extent that the orchards are picked in the order of the relative rates of maturity of the fruit, the differences in returns over a period of several years between growers occasioned by having varying proportions of their total crops in one pool rather than in another tend to reflect the inherent differences in the characteristics of their fruit. In any one year, however, the differences in returns may arise solely from temporary fluctuations in the supply and demand situation.

The employment of multiple time pools based upon picks presupposes that the start and completion of each pick-around is precisely determined. Otherwise, it is impossible to assign each lot of fruit to a specific pool. If each orchard were picked in rotation and each picked the same number of times in a given year the determination could easily be made. Under the conditions existing in the area served by the Santa Paula Citrus Fruit Association, however, such a procedure appears impractical to follow at all times. During the rainy season it is frequently impossible to adhere strictly to a predetermined picking schedule and still secure economical operation. A given rain may not be uniform over the entire area with the result that some orchards are less affected by it than are others. And even when the rain is fairly uniform, some orchards because of the soil and topography can be picked much sooner after the rain than can others. Furthermore, the fruit in some orchards grows faster or matures more rapidly than it does on other orchards. Consequently some orchards need to be picked more frequently than

do others. These conditions suggest that in this Association the picking schedule should be flexible rather than rigid.

Flexibility in the picking schedule, however, does not preclude the determination of the start and completion of each pick-around, although it does introduce a degree of artificiality. For example, the first pick-around of an association in each year can be deemed to start at the beginning of the crop year. Between the middle of October and the first of November there is usually relatively little mature fruit on the trees. Completion of the first pick-around can be deemed to occur when all of the orchards of the growers have been picked once, except (1) orchards, which in the opinion of the management do not have a sufficient volume of fruit available for picking at the approximate time for picking in accordance with the picking schedule, (2) orchards which, because of weather conditions or the condition of the land, cannot be picked at the approximate time for picking in accordance with the picking schedule, and (3) orchards which are prevented by the owner from being picked at the time for picking in accordance with the picking schedule. The second pick-around could be deemed to start immediately upon the close of the first and could be deemed to end when all orchards except as provided above have been picked twice, and so on.

There is necessity for more rigidity in picking when each pick-around constitutes a pool than when a number of pick-arounds are combined, if each grower is to receive impartial treatment. When a number of pick-arounds are combined in one time pool considerable flexibility may be permitted on each pick-around except the last one in each time pool. Such flexibility may be of considerable advantage to some growers and to the association as a whole without detriment to any grower. Thus, in each of the earlier pick-arounds some orchards may not be picked at all, while other orchards may be picked twice. The order of picking may be modified to suit the convenience of individual growers and the size of the rings used in picking may be adapted to the desires of the individual growers. On the last pick-around in each time pool, however, there is need for a high degree of uniformity with respect to both the order of picking and the size of the rings used. 28/

Associations which combine two or more pick-arounds in one time pool generally require that all orchards be picked once on the last pick-around. This requirement can be met without serious disadvantage to any grower provided weather conditions do not unduly delay the picking of his fruit. In the territory of the Santa Paula Citrus Fruit Association, picking has been reasonably free from delay occasioned by weather conditions from the first of May until November, but in each of the other months and particularly in February and March the picking on some orchards has had to be postponed for several weeks.

Suppose, for example, that it is desired to establish two time pools during the crop year based upon picks, and that it is desired to have the first pool include mainly fruit which must be shipped in the six months, November through April, and the second pool include mainly fruit which can be shipped in the six months, May through October. 29/ If this is to be accomplished the last pick-around in the first pool should end sometime prior to May 1, and the lask pick-around in the second pool should end prior to November 1. In this case the closing of the second pool would not usually be interfered with by weather conditions, but

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28/ When each pick-around constitutes a pool every pick-around is the last in some time pool.

29/ The relation of separate color pools to this problem is discussed later.

as needs. These conditions [illegible] that in this [illegible] the picking [illegible] [illegible]

Flexibility in the picking schedule, however, does not imply that the quantity of the crop, and [illegible] of cash disbursements, [illegible] in [illegible] of anticipation. For example, the first picking [illegible] in any year can be [illegible] at the height of the crop [illegible] between the middle of October and the first of November [illegible] usually [illegible] the first picking [illegible] all or two-thirds of the growers [illegible] except (1) [illegible], which in the opinion of the management [illegible] for picking at the [illegible] (2) [illegible] because of [illegible] conditions of the land, cannot be picked [illegible] in accordance with the picking schedule, and (3) [illegible] The second picking [illegible] the first [illegible] and so on.

There is a capacity for some rigidity in picking [illegible] that where a number of pick-rounds are [illegible] If a number of pick-rounds [illegible] at the same time [illegible] in each pool. Such flexibility [illegible] In each of the earlier pick-rounds [illegible] may be picked [illegible] the convenience of individual growers [illegible] in each pool, however, there [illegible] degree of [illegible] which [illegible] both the order of picking [illegible]

[illegible] or more pick-rounds [illegible] that will [illegible] in the last pick-rounds [illegible] conditions do not greatly [illegible] first of [illegible] in February and [illegible] has had to be postponed for several weeks.

Suppose, for example, that it is desired to [illegible] the crop year based upon [illegible] and that it is desired to have the first pool [illegible] fruit which must be picked [illegible] and the second pool [illegible] fruit [illegible] in the first pool [illegible] in the second pool [illegible] the second pool could not [illegible]

16/ [illegible] each pick-round [illegible] a pool [illegible] in the last [illegible]

17/ The selection of [illegible]

the closing of the first pool might be interfered with in any year and is certain to be interfered with in some years. From 1925-26 to 1934-35 an average of 26 per cent of the Association's annual shipments was made in the six months, November through April, while an average of 24 per cent of its annual deliveries occurred in the four months, November through February. It appears from these figures that, if deliveries in the first pool are to conform closely with the shipments in the winter months, the end of the last pick-around in the first pool would need to be in March, preferably in the first half. This is precisely the time, however, when picking is likely to be delayed because of rain.

Under such conditions it appears that some modification in the requirement that each orchard be picked once on the last pick-around in a time pool is necessary to avoid some growers being penalized at times because of their position in the picking schedule. Continuing with the above example let us assume that, in the absence of interference with the picking schedule, the first pool can be closed about March 15. On March 10, however, an extended rainy period occurs which delays picking for two weeks. About 90 per cent of the orchards were picked prior to March 10, but 10 per cent of them still remained to be picked. By the time these were eventually picked a larger quantity of fruit was secured from them than would have been obtained if they had been picked two weeks earlier. If all of the fruit is placed in the first pool, assuming it is the lower-priced one, these growers will be penalized, while if all of the fruit is placed in the last pool, assuming it is the higher-priced one, they would receive an undue advantage. What is needed in this situation is a basis for dividing the deliveries between the two pools in accordance with the relative amounts of fruit that would have been in each if the picking had not been delayed.

The suggestion has been made that the division be based upon the number of days between pickings. For example, assume that on the last pick-around in the first pool, Grower A's orchard would have been picked 40 days after the previous picking had weather conditions not interfered, but because of such interference it was picked 10 days later, and that 100 field boxes were obtained. With this situation four-fifths of the 100 boxes, or 80 boxes, would be placed in the first pool and one-fifth of the 100 boxes, or 20 boxes, would be placed in the second pool.

When the delay in picking is caused by conditions over which the individual grower has control, no adjustments in his delivery as between pools appear warranted. In the event that the picking on the last pick-around in the first time pool is delayed by the grower, all the fruit from that pick might well be placed in the first pool. On the other hand, if the picking on the last pick-around in the second time pool is delayed by the grower all the fruit from that pick might well be placed in the first time pool of the following year. This assumes that there are only two time pools during the crop year and that on the average the returns per unit from the first time pool are lower than those from the second time pool.

With regard to the sizes of the rings used in picking, it would seem that, with the exception of the last pick-arounds in each time pool, considerable variation between orchards might be permitted, particularly if size pools are employed. On the last pick-around in each time pool, however, impartial treatment, of all growers requires that the same ring size be used, except that on the last pick-around in the first time pool a smaller ring size may be used if desired by the grower, while on the last pick-around in the second time pool a larger ring size may be used if desired by the grower.

Pooling on the Basis of Color Classifications

When conditions are such that multiple time pools based upon picks are indicated, separate pools for the several color classifications are also likely to be needed in order to preserve substantial equity between growers. [30] The presence of definite seasonal variations in prices and consumption of lemons indicates that lemons which can be shipped in the summer months are from a market standpoint usually worth more per unit than are lemons of the same grades and sizes which can be shipped only in the winter months. The time of the year during which lemons can be shipped depends not only upon the time they are picked but also upon the length of time they can be kept in storage without physical loss. In general, the latter is closely associated with the color of the lemons at the time of delivery.

Although there is wide variation in the length of time lemons in the different color classifications can be kept in storage without serious loss from deterioration in grade and shrinkage, according to the inherent characteristics of the lemons and the storage conditions, the average lengths of time for the different colors are roughly as follows: dark green, 4 to 6 months; light green, 3 to 4 months; silver, 1½ to 2½ months; and yellow, 1 to 1½ months. Dark-green lemons delivered in March can be shipped in the early summer months, but yellow lemons delivered in March must ordinarily be shipped before the usual advance in prices and consumption occurs.

There is considerable variation between the growers in this Association with respect to the proportions of their fruit in the several color classifications. This is illustrated in table 38. Over the four-year period 1931-32 to 1934-35, a relatively large percentage of some growers' fruit consisted of dark and light-green lemons, while a relatively large percentage of other growers' fruit consisted of yellow and silver lemons.

One association which has four time pools based upon picks, in addition to pooling by grade and size, also pools on the basis of three color classifications. The additional work which color pools entail relates entirely to accounting. The physical handling of the fruit is the same with as without color pools. The number of units of each grade and size in each color classification of the individual growers' fruit can be readily ascertained since the several color classifications are packed separately. The determination of the price rates on the same grades and sizes in different color pools, however, requires that the sales of the fruit from each color classification be recorded separately. Also, the time required to make out the individual growers' pool statements is increased.

When two or more pick-arounds are combined in one time pool it does not necessarily follow that there should be the same length of pooling period for each color classification. In fact, if the fruit in a given time pool is to conform most closely to a definite shipping period, the number of pick-arounds in each color pool would need to be varied. Again if two time pools are assumed during the crop year, divided so as to include in the first chiefly fruit which must be shipped in the winter months and in the second chiefly fruit which can be shipped in the summer months, it appears that at least one more pick of yellow and silver lemons than of light and dark-green lemons should be in the first time pool, while one less pick should be in the second time pool. For example, instead of having

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[30] When multiple time pools are based upon shipments the only reason for also having separate color pools relates to grades.

the first time pool include all lemons picked in the first three pick-arounds and the second time pool include all lemons picked in the fourth to the last pick-arounds, the first time pool could include all lemons picked in the first three pick-arounds plus all silver and yellow lemons from the pick immediately following the third pick-around, and the second time pool would then include all lemons picked in the fourth to the last pick-arounds, except those silver and yellow lemons from the pick immediately following the third pick-around. If pooling is on the basis of color classifications, the above type of arrangement would involve practically no additional work.

As contrasted with the determination of price differentials between the several grades and sizes discussed previously, the price differentials between color classifications should be based upon weighted-average prices rather than upon a simple average of prices on corresponding days. A color pool is a type of time pool, and consequently the price differentials between fruit from different color classifications should reflect the difference in time at which they were shipped. Under some conditions, however, it appears that the price rates to growers for comparable grades and sizes of two or more of the several color classifications should be the same even though the weighted-average selling prices were different.

The price of lemons tends to fluctuate sharply within relatively short periods of time, and these fluctuations can seldom be forecast very far in advance. During a given period of time when the market level is relatively favorable an association may be shipping ripe and silver lemons and holding the light and dark-green lemons delivered at the same time, although the green lemons are also ready for shipment. At the time the green lemons are eventually shipped prices may be materially reduced. The result of such a situation is that green lemons bring less than silver and yellow lemons of comparable grades and sizes.

Although the decision of the manager to hold the green lemons may have resulted in the largest total returns to all growers combined, nevertheless those growers whose deliveries consisted mainly of green lemons would have individually secured larger returns if the decision of the manager in this particular case had been different. It hardly suffices to point out that at some other time the market may advance rather than decline, and that over a period of years prices in the last half of the crop year are usually above the prices in the first half of the crop year. The contention that fruit of long keeping quality is always worth as much and frequently is worth more than fruit of short keeping quality has considerable merit. It can be shipped during the same time that the latter can and in addition can be shipped after the latter is no longer fit for consumption.

One method of giving recognition to the wider market opportunity possessed by fruit of long keeping quality would be to base the price rates to growers on the weighted-average prices whenever they are higher on the longer-lived fruit than on the shorter-lived fruit, but to combine both in one pool when they are not. Thus, two or more separate color pools would be combined within each time pool in the event the following conditions are found to exist: (1) if a given grade of dark green brings as low or lower price per unit than the same grade of light green, silver, or yellow; (2) if a given grade of light green brings as low or a lower price per unit than the same grade of silver and yellow; and (3) if a given grade of silver brings as low or a lower price per unit than the same grade of yellow.

Price Risks in Time Pools

The chief source of risk in the marketing of lemons relates to sharp fluctuations in prices from day to day, from week to week, and from month to month. Table 39 is designed to show the extent of the changes in the prices of lemons on the New York auction market from one day to the next during 1933-34 and 1934-35. The significant fact illustrated in this table is that prices of lemons change rapidly and that the changes are frequently pronounced.

The pooling of lemons provides a type of insurance for growers against the risk of loss from having the bulk of their lemons sold on days when prices are low. Losses from sharp drops in market prices may fall on any of the numerous growers, but actually they will fall upon only a few of the entire number. Pooling does not free the growers from loss, but it does distribute among all the growers the burden of losses which would otherwise fall heavily upon a few.

Short time pools such as the monthly shipping pool or the pick-around pool are effective in insuring growers against losses from price declines within a short space of time, but do not provide adequate insurance against price decreases from one month to another. Table 40 shows the extent of the changes from November, 1933, to October, 1935, in the monthly average f.o.b. prices received for lemons shipped by the Santa Paula Citrus Fruit Association, after adjusting the monthly prices for the normal seasonal variation in prices given in table 30. In seven months during this period, the average price was within $0.25 a packed box of the average price in the preceding month, but in five of the months the average price was from $0.51 to $1.00 a box above or below the average price in the preceding month, while in three months it was from $1.01 to $2.00 above or below the average price of the preceding month. With short time pools some growers would have secured during this period relatively large gains while others would have suffered relatively large losses, mainly as the result of chance.

An increase in the lengths of the pooling periods reduces the chance both of large gains and of large losses. From the standpoint of reducing the hazards to individual growers arising out of the unpredictable declines in prices an annual pool is superior to multiple time pools. Two time pools during the season are inferior to an annual pool but are superior to shorter time pools, such as the pick-around pool.

Total Returns to All Growers Combined

The foregoing sections of this part of the report have largely dealt with the effects of variations in the length of the pooling periods upon the division of the total net returns of an association between the individual growers. This is important, but it is also important to determine what effects variations in the length of the pooling periods have upon the size of the total net returns, that is, whether the total amount of money available for division between the individual growers is likely to be larger or smaller with one type of time pools than with another. From the standpoint of time pools, the two factors affecting the total amount of the net returns of an association relate to orderly marketing and costs of operation.

Relation of the Length of Pooling Period to Orderly Marketing.-- By orderly marketing we mean the regulation of shipments as to quantity, quality, time, and place in accordance with market demands. Only by regulating shipments in such fashion is it possible for an association to obtain the largest gross returns possible under the particular circumstances with respect to the national supply and demand situation which prevails during a given crop year.

[illegible]

The initial [illegible] in the [illegible] day to day [illegible] New York [illegible]

The pooling of leases provides a type of insurance [illegible] against [illegible] leases [illegible]

[illegible] the monthly shipping [illegible] against [illegible] 1.01 to 2.01 [illegible]

In [illegible] the [illegible] of the pooling [illegible] leases. [illegible]

[illegible]

The [illegible] section of this part of the report [illegible] pooling [illegible]

[illegible]

TABLE 39

Lemons: New York Auction Market; Frequency Distribution of Extent of Changes in Weighted Average Prices per Packed Box between Consecutive Days, 1933-34 and 1934-35

Class interval in cents per box	1933-34			1934-35		
	Number of days	Per cent of days	Cumulative per cent of days	Number of days	Per cent of days	Cumulative per cent of days
80 and over	4	1.6	1.6	5	2.0	2.0
71 to 80	4	1.6	3.2	1	0.4	2.4
61 to 70	4	1.6	4.8	8	3.2	5.6
51 to 60	6	2.4	7.2	6	2.4	8.0
41 to 50	12	4.8	12.0	12	4.8	12.8
31 to 40	20	8.0	20.0	19	7.6	20.4
21 to 30	52	20.9	40.9	31	12.5	32.9
11 to 20	59	23.7	64.6	64	25.7	58.6
0 to 10	88	35.4	100.0	103	41.4	100.0
Total	249	100.0		249	100.0	

TABLE 40

Lemons: Santa Paula Citrus Fruit Association; Frequency Distribution of First Differences between Monthly F.O.B. Prices after Adjusting for Normal Seasonal Variation November 1933 to October 1935

Class interval in dollars per packed box	Number of first differences
0 to 0.25	7
0.26 to 0.50	8
0.51 to 1.00	5
1.01 to 1.50	2
1.51 to 2.00	1
Total	23

The total weekly lemon shipments of associations affiliated with the California Fruit Growers Exchange are, during most of the season, determined by allotments received under the Exchange Lemon Agreement. The allotments to the several associations are based upon the volume of lemons which they have in storage, and no association is permitted to exceed its allotment. Thus, as far as regulation of lemon shipments as to time is concerned, most associations operate under a coordinated program rather than individually. No evidence was found that the length of the pooling periods employed by associations in any way affected their ability to fit into the coordinated program.

Although the total weekly shipments may be fixed for an association, the character of lemons to be shipped is left to the individual association. It was found that in some cases the character of fruit shipped during a specific short period was affected by the length of the pooling period. The tendency among a number of associations employing pick-around pools was to ship dark-green lemons from an earlier pick in order to close that particular pool, when from the standpoint of the association as a whole it would have been better to have shipped silver lemons from a later pick. Growers naturally desire to obtain full payment on their fruit at an early date. When multiple time pools based upon picks are employed they frequently ask the manager "When are we going to receive final payment on this particular pool?" In order to make an early final payment managers are at times forced to ship fruit which in their judgment should be held and to hold fruit which in their judgment should be shipped.

Relation of the Length of Pooling Period to Costs of Operation.-- There appears to be little difference in the costs of operation between multiple time pools based upon shipments and an annual pool based either upon shipments or picks. The accounting costs incident to the pool settlement are increased with the increase in the number of pools during the season, but this is in part offset by the additional costs of making advance payments when the pooling periods are long. On the other hand, careful observation indicates that the accounting costs are somewhat larger with multiple time pools based upon picks than with an annual pool.

With pick-around pools, for example, there is frequently fruit from two pools and sometimes fruit from three and even four pools in the same car. The identity of the fruit from each of the pools must be maintained until after the car has been sold, and the sales returns must be divided between the several pools. In order to avoid mistakes great care must be exercised both in the packing plant and in the office.

Most associations employing pick-around pools make advance payments on green lemons, since these are generally held in storage for some months after being delivered. The expense of so doing is not much less than the cost of making advance payments under an annual pool. The cost of making the final payments is, of course, greater with pick-around pools than with an annual pool since there are usually from six to nine more final settlements to make.

An element of cost which may at times be affected by the length of the pooling period relates to picking. Under both the annual pool and the multiple time pools based upon picks, some growers are inclined to interfere with the picking schedule of the association. With an annual pool some growers may want to pick out of turn in order to avoid weather hazards or to carry on a particular cultural operation at a given time. With pick-around pools these same incentives are present, and in addition there is the incentive for growers to have their fruit in a high-priced rather than in a low-priced pool. In an attempt to do so, some growers are inclined to manipulate their cultural operation for the purpose of delaying the picking on their orchards, or to bring pressure upon the manager to have their

orchards picked early. To the extent that such practices interfere with the normal picking schedule of the association costs of operation may be increased.

Conclusions with Respect to Time Pools

Under the conditions which are likely to prevail over the next several years, comparable grades and sizes of lemons produced by some growers in the Santa Paula Citrus Fruit Association will, from a market standpoint, tend to be worth more per unit than those of other growers. Within the area covered by this Association there are inherent differences between orchards in the time of the season during which the lemons produced on them can be shipped. A larger proportion of the lemons from some orchards than from others can be shipped during the summer months. Although the prospects are that the wide differential between the prices of summer and winter lemons which has prevailed will be materially narrower during the coming years, it does not seem that this differential will entirely disappear. Over the next several years the prices received for lemons shipped during the summer months will tend to average somewhat above the prices received for lemons shipped during the winter months. The consumption of lemons in the United States is also much higher in the summer months than in the winter months. Relative to consumption, however, supplies available for shipment have been heavy in the winter months and light in the summer months. There has seldom been a surplus of lemons in the summer months, but frequently a surplus in the winter months. Thus, the available evidence indicates that growers whose fruit can be shipped during the summer months will, on the average, not only receive a somewhat higher price per unit, but will also be able to market a larger proportion of their crops than will growers whose lemons must be marketed in the winter months.

From the standpoint of closely reflecting in the returns to individual growers the average differences in the market value of their respective crops over a period of several years, multiple time pools are superior to an annual pool. Within the Santa Paula Citrus Fruit Association, it does not appear feasible to confine the membership to the owners of those orchards which are essentially alike with respect to the time of the season during which the lemons produced on them can be shipped. The inclusion and exclusion of orchards on an area basis would not give a high degree of uniformity, since within very small areas there are significant differences between orchards in this respect. The available evidence indicates that at least two time pools during the season are necessary in order to maintain substantial equity between growers, but that no more than two time pools are needed. From the standpoint of both prices and consumption there are two fairly distinct marketing periods during the season; namely, November through April and May through October. Within each of these periods, however, the tendency is for the monthly prices over a number of years to average about the same. It appears, therefore, that the first time pool might well include mainly fruit which must be shipped during the winter months and the second time pool include mainly fruit which can be shipped during the summer months.

Most associations employing multiple time pools base them upon picks rather than upon shipments. Under both types difficulties arise in connection with the transition from one pooling period to the next, and the larger the number of time pools the greater are the difficulties. On the whole it appears that the difficulties of transition are less with multiple time pools based upon picks than with those based upon shipments.

When conditions are such that multiple time pools are needed in order to maintain substantial equity between growers, it appears that separate color pools are also necessary if the time pools are based upon picks, since the time of the year that lemons can be shipped depends not only upon the time they are picked but

also upon their keeping quality. When two or more picks are combined in one time pool it may be desirable to have more picks of one color than of another in a given time pool.

From the standpoint of insuring individual growers against the risks of marketing, two time pools during the season are inferior to the annual pool, but are superior to three or more time pools.

From the standpoint of securing the maximum total returns to all growers combined, two time pools during the season are no better than the annual pool and probably are inferior, but they are at least as good as three or more time pools and probably superior.